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for economy in **Oil-filled cables**

Here is BICC's latest development in 33kV power transmission—the Ductless, Shaped-Conductor, Oil-filled Cable. Dispensing with fillers and built-in ducts, this new design is essentially one of economy in materials, resulting in reduced cable costs. A full range of joints and terminations has been specially designed by BICC for use with this cable.

D.S.O. Cables can be supplied with aluminium sheaths or reinforced lead sheaths and copper or aluminium conductors. Frequently the all-aluminium D.S.O. Cable (aluminium conductors and aluminium sheath) offers the most economical design.

BICC

DUCTLESS SHAPED-CONDUCTOR OIL-FILLED DSO

33kV CABLES

Further information on D.S.O. Cables is contained in Publication No. 392—available on request.

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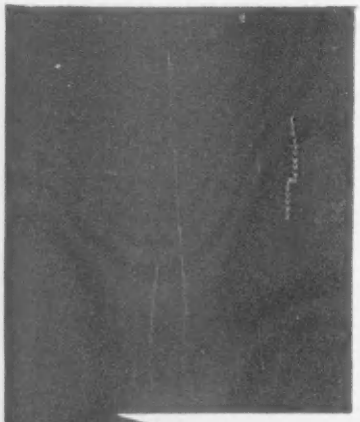

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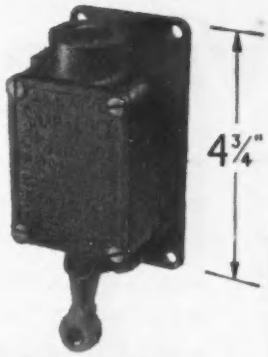
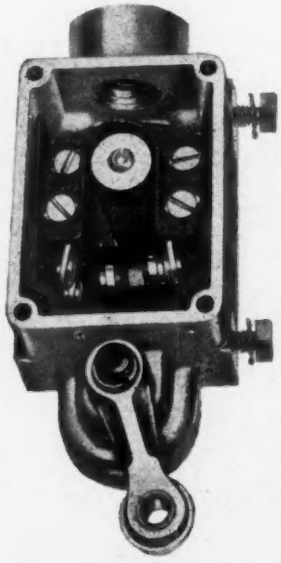


STANDARD

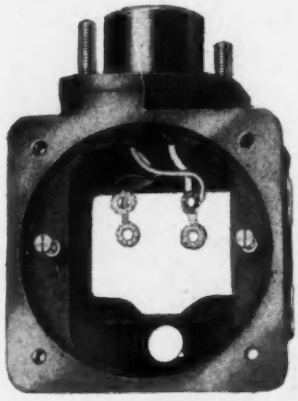


Two only replaceable assemblies in the electrical side: moulded one-piece contact block and arm. Interchangeable on all Mark II versions.

Water Oil and Dustproof or Flameproof versions

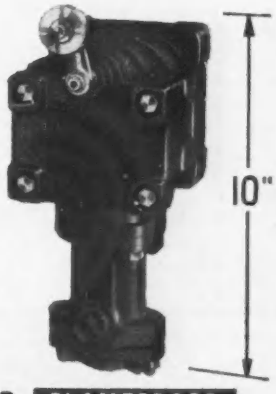
WATER, OIL & DUSTPROOF

Single pole, double break, double throw, operates with either circuit normally open with other closed, or maintaining in either position, or available with central (neutral) position and/or centre connection. Heavy aluminium die-cast case. Conduit ¾" B.S., or No. 3 Admiralty Pattern Cable gland entry. Two-screw side mounting or backplate mounting in two styles, or Tandem style (back to back mounting). Operating lever position adjustable in 7.5 deg. increments through 82.5 deg. either way from normal.



The mechanism of the Flameproof switch is easily removable as a unit for servicing.

Standard Neutral position or Centre connection

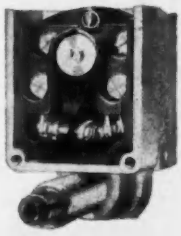


FLP FLAMEPROOF

SINGLE OR DOUBLE ENTRY

Buxton certificates No. 3574 (Group I) No. 3575 (Groups II and III gases). Meehanite iron castings. Self wiping solid silver contacts, interchangeable plugs and sockets. ***Single SWA cable entry (standard); double entry if required.*** *Operating lever position adjustable in 7.5 deg. increments through 360 degs. Single pole, double break, having one normally closed and one normally open circuit. Available with central (neutral) position and/or centre connection.*

MARK II



B.S.A. SNAP-LOCK ACME

Catalogue of switches and levers on request

HEAVY DUTY LIMIT SWITCHES

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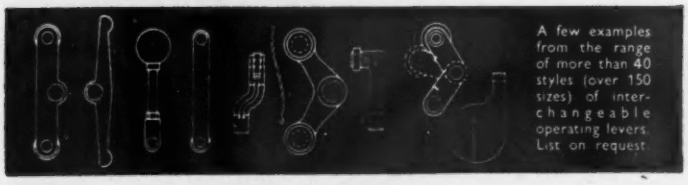

A few examples from the range of more than 40 styles (over 150 sizes) of interchangeable operating levers. List on request

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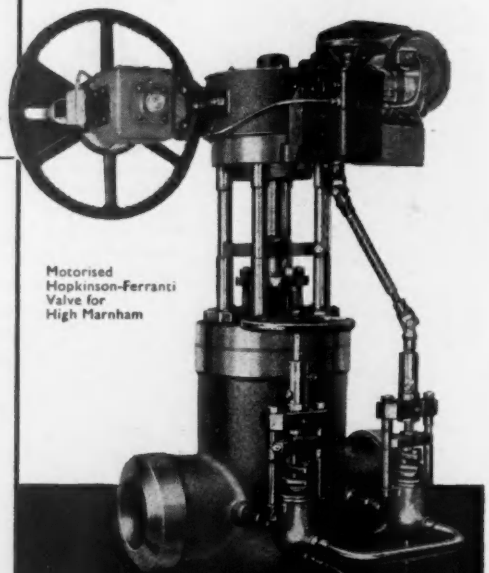
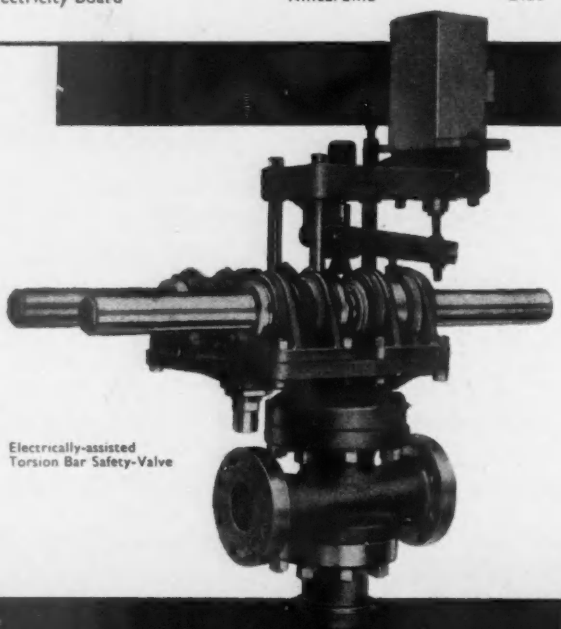
Valves over 2000 lb/sq. in. pressure

Hopkinsons Limited have supplied, or have on order, valves for pressures above 2000 lb/sq. in. for the following installations

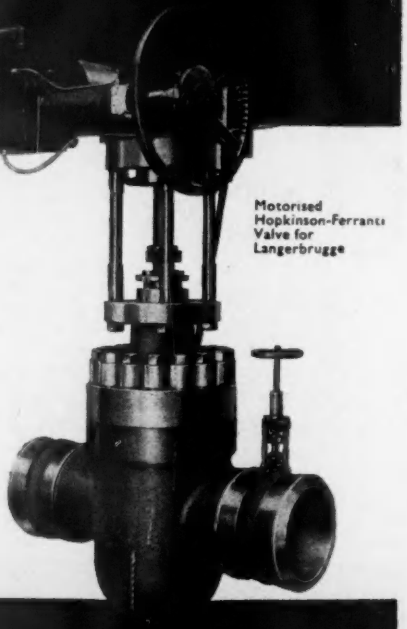
Name of user	Station	lb/sq. in.
Central Electricity Generating Board	High Marnham	2450
Centrale Thermique Minière de l'Est de Charleroi, Belgium	Farciennes	2130
Electricité de France	Emile Huchet	2130
S.A. Charbonnages de Monceau-Fontaine, Belgium	Monceau-sur-Sambre	2160
Elec. Escaut, Belgium	Langerbrugge	2160
Steel Co. of Wales Ltd.	Margam	3150
South Zeeland Power Company, Denmark	Masnedø	2087
Central Electricity Generating Board	Thorpe Marsh	2450
Soc. Meridional di Elettricita	Naples	2558
Electricity Commission of New South Wales	Vales Point	2450
Central Electricity Generating Board	Blyth 'B'	2450
South of Scotland Electricity Board	Kincardine	2450



Motorised Hopkinson-Ferranti Valve for High Marnham



Electrically-assisted Torsion Bar Safety-Valve



Motorised Hopkinson-Ferranti Valve for Langerbrugge

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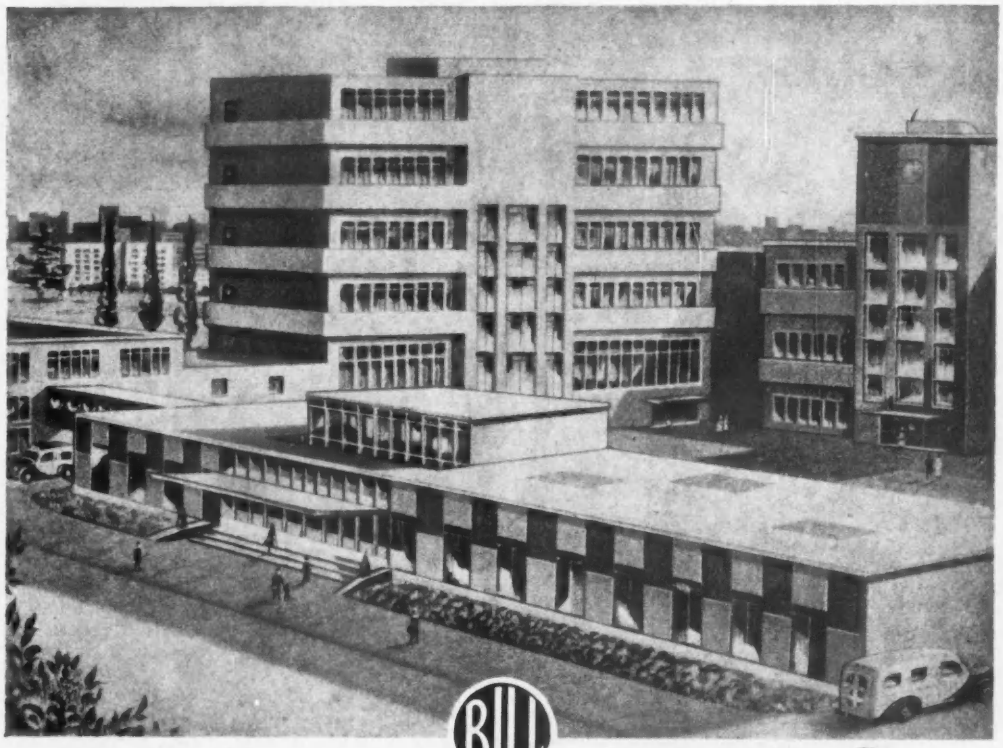

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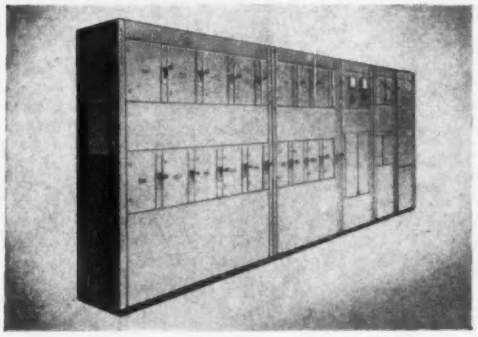

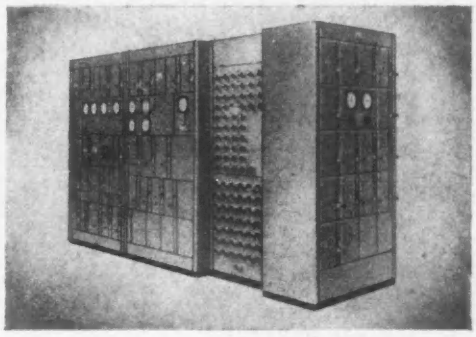

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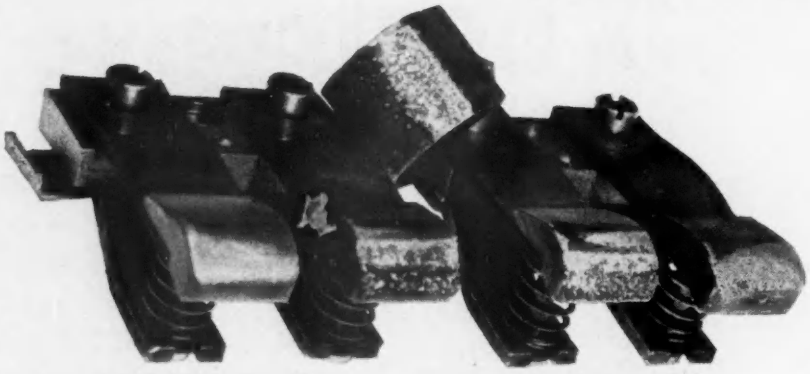
These pictures tell a story



ELMET facings increase transformer tap change contact inspection interval from 4,000 operations to 10,000—15,000 operations

THESE UNRETOUCHED PHOTOGRAPHS show tap-change contacts exactly as removed from No. 1 Transformer (upper group) and No. 2 Transformer (lower group) at the Portobello Sub-Station of the South of Scotland Electricity Board. The following official report by the Board's Engineering Department fully explains their significance. The report is reproduced by permission of the Board.

SOUTH OF SCOTLAND ELECTRICITY BOARD

Transmission Department

Metro-Cutanit Tap Change Contacts

1. General

When installed, transformers T.1 and T.2 at Portobello Sub-station were of new design and resistors were fitted to limit the current across the arcing contacts. These resistors frequently burned out and it was finally decided to remove them.

Considerable burning was experienced in the arcing contacts and in 1953 the manufacturers fitted an experimental number of Metro-Cutanit tipped contacts, both fixed and moving, arranged so that a comparison could be made with copper contacts breaking the same load.

2. Recent Experience

The contacts were inspected at regular intervals and it was found that the copper contacts had to be dressed up or completely replaced at 4000 operations while the tipped contacts were only slightly pitted and were left untouched.

No. 1 transformer was changed completely to tipped contacts in 1954 and experimentally, No. 2 was fitted with copper moving and tipped fixed contacts.

The photographs show the contacts as found on inspection in May 1958. The contacts in No. 1 transformer have completed 15,000 operations since installation and are still in good condition. The copper moving contacts in No. 2 transformer are deeply burned after 3,800 operations and the tipped fixed contacts still in serviceable condition after 18,000 operations.

3. Conclusion

It is becoming increasingly difficult to take the larger transformer units out of service for essential maintenance and, since the inspection of the tap change contacts generally determines the frequency and length of such outages, any factor which contributes to the limitation of inspection of the contacts would increase the efficiency of the system. There seems little doubt that the installation of tipped contacts will limit the inspections required from 4,000 operations to 10,000-15,000 operations.

There is an ELMET contact metal for every purpose

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It is on this foundation that the reputation of Glovers has been established and we are confident of our ability to maintain our position as one of the leading cable manufacturers.

This Company will continue to play a significant part in the progress and development of the electrical industry.

It is our prime objective to provide an independent sales service, backed by the specialist resources of our Technical Organisation, to meet the individual needs of our customers.

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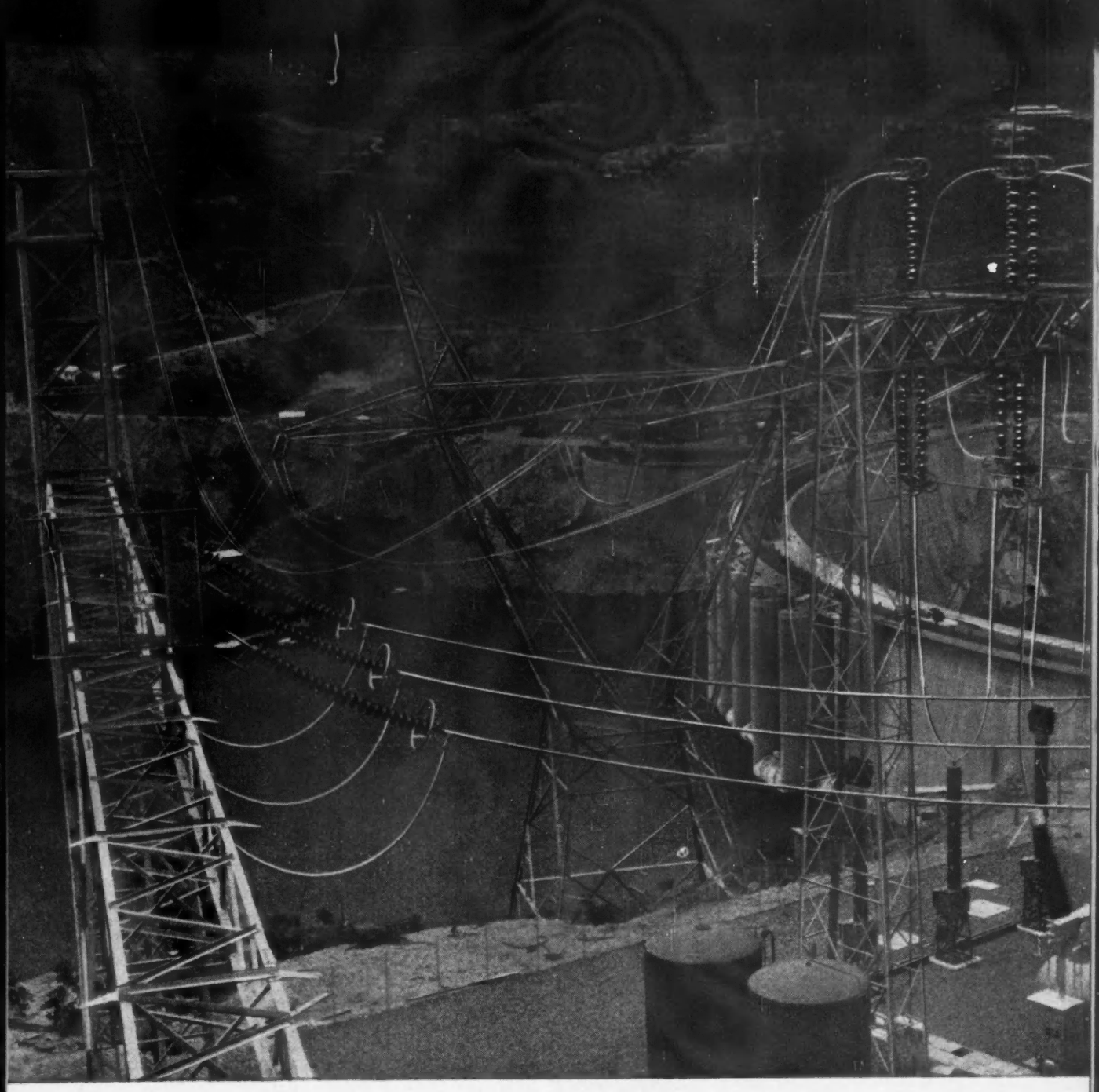

ALUMINIUM FLEXIBLE BUSBARS FOR KARIBA

One of the six 330 kV substations of the new hydro-electric scheme. At this, as at all the substations, AWCO have supplied all the stranded aluminium conductors for the flexible Busbars.
The conductor selected for the Busbars consists of 127/·169 in. stranded aluminium wires with a total diameter of 2.197 in.
Aluminium was chosen as the most economical metal to provide the reliability required under the arduous operating conditions in this part of Rhodesia. The greater diameter of aluminium conductor permits the combination of a load of 1200 amps at 330 kV in high ambient temperatures and at high altitudes.

Consultants: Merz and McLellan
Main Contractors: A.E.I. LTD., Switch Gear Division, Willesden

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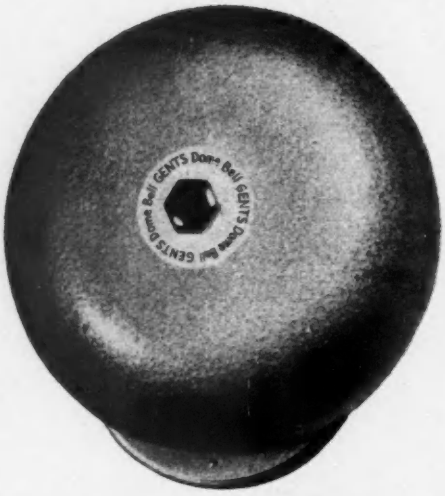
Available in 4", 6", 8" and 10" diameter gong sizes. Gongs are stove-enamelled grey with a "hammer" finish and the centre bolt is bright nickel-plated. Totally enclosed dust and dirt-proof contactless movement, ensures no radio or television interference. For operation on 40/50 cycles in a wide range of voltages. (On 60 cycles at special request.)

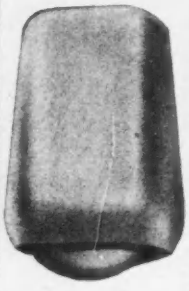


'UNDERDOME' BELLS

Available with nickel-plate and laquered Dome gong in 3" and 4" diam. sizes and with 3" diam. bright nickel-plated Church gong.* Supplied in the following voltages:

Fig. 396 3" A.C./D.C. 3-4½v. 7/6, 12v. 8/10, 24v. 10/4. Fig. 392 3" A.C. 4-6v. 7/- • Extra for 3" Church gong 2/4. Fig. 396 4" D.C. 4½-6v. 10/- Fig. 396 4" A.C. 8v. 10/-

'NEATABELL' ALL-IN-ONE BATTERY BELL



An ideal domestic bell having its own batteries and 3" deep section bell under a specially designed cover which acts as an amplifier. Both base and cover are made of white resilient shatter-proof plastic. Uses two Ever Ready batteries No. U11 or equal. Easily installed in a few moments by wiring push to two terminals at back. Fitted with TV. suppressor. Gong finished nickel plate and lacquered.

Fig. 400. Packed individually in attractive cartons (excluding batteries) 12/8

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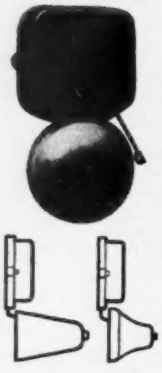

Available with 3" diam. nickel-plate and lacquered Dome gong, 3" diam. bright nickel-plated Church gong or bright nickel-plated Sheep gong.* Supplied in the following voltages:—

Fig. 391 Battery working (D.C.) 3-4½v. 10/4, 6v. 13/- 12v. 13/-, 24v. 14/6. Fig. 391 Transformer working (50 cycles A.C.) 3-4½v. 10/4, 8v. 10/2, 12v. 10/2, 24v. 11/8 • Extra for Church gong 2/4 • Extra for Sheepgong 3/8

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S & L will be pleased to discuss any problems associated with clean conditioning of industrial components.

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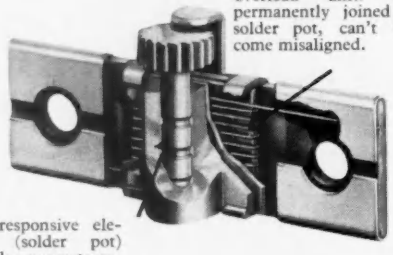

Heat-producing element is an integral part of overload unit. It's permanently joined to solder pot, can't become misaligned.

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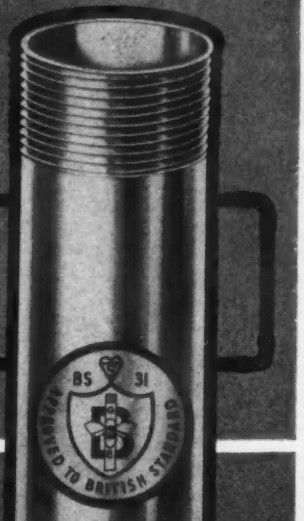

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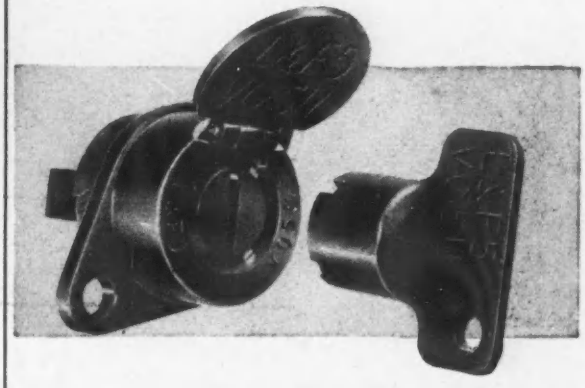
Our service includes the assistance of technical staff whenever and wherever required.



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Combination Works, **WILLENHALL, STAFFS.**

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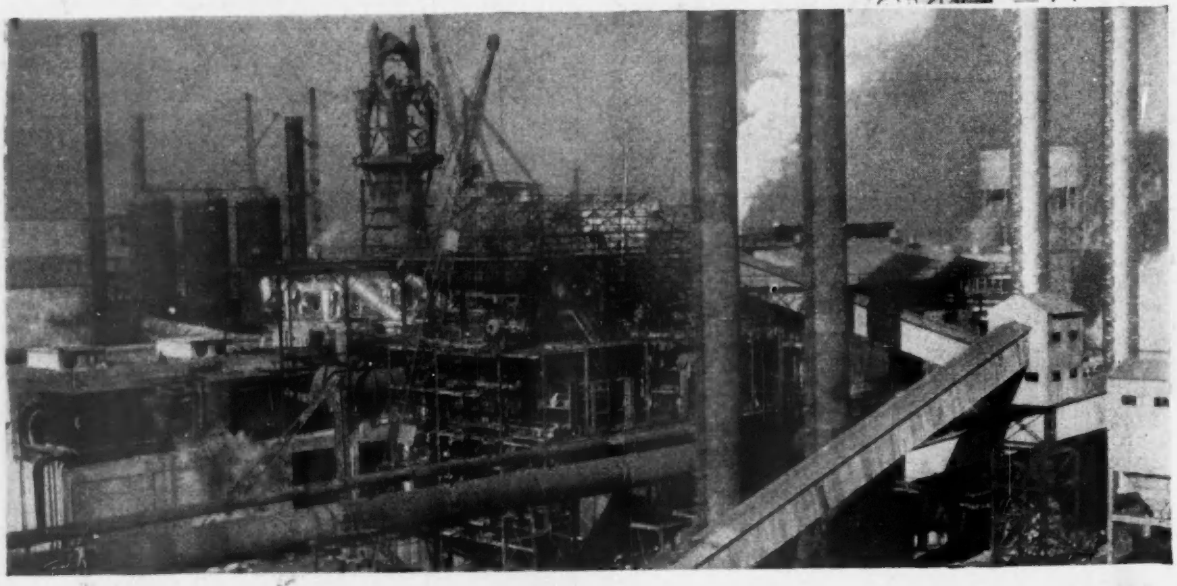
Grams: Squirrels WILLENHALL

THE POWER BEHIND THE GODDESS

The Steel Goddess was the description given recently to the new Durgapur steelworks. This was apt not only because of its imense importance to Indian steel, but also because Durgapur means "the place of Durga" and Durga is the ten-armed Goddess of Bengal.

The power behind the annual production of one million ingot tons of steel is one of our many responsibilities at Durgapur. The Goddess's heart, the power plant, will consist of four Simon-Carves water tube boilers producing steam for vital steelworks services; the associated fuel and ash handling plants, cooling system and steam distribution network will all be Simon-Carves designed and built.



COMPLETE POWER PLANT BY *Simon-Carves Ltd*

SIMON ENGINEERING GROUP

STOCKPORT, ENGLAND

and at CALCUTTA · JOHANNESBURG · SYDNEY · TORONTO

At Durgapur we are also building the coke ovens and coke handling plant, the by-product plant, the coal washery, blending and handling plant and the inter-connecting services for gas, tar and steam.

5

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a completely new range of
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TO THE *NEW* SUPPLEMENT
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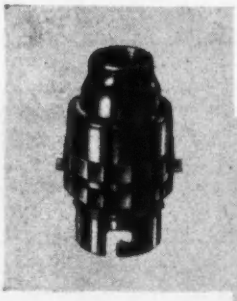
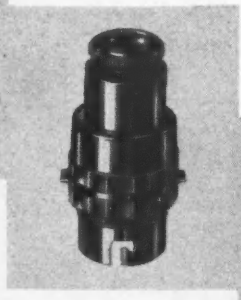
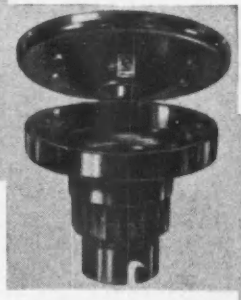


Screwed Entry V/2



T.R.S. Gland V/3

Angle Batten V/7



Backplate with Terminal V/19
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Ensures the interchangeability of shade carrier rings and Home Office shields.

Tolerances of screw threads provide for variations of dimensional changes during the life of the lampholder.

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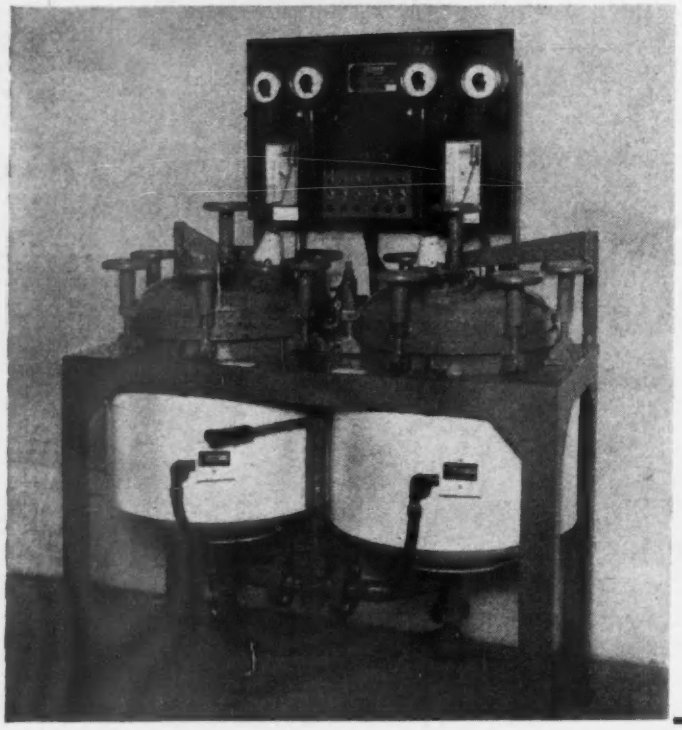

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ENSURES DEEP PENETRATION

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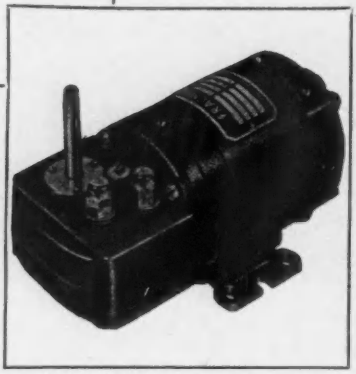
FRACTIONAL HORSEPOWER MOTORS

from 1/250th to 1/3rd H.P.



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★ *Send for illustrated leaflet No. AB57/K showing our range of motors*

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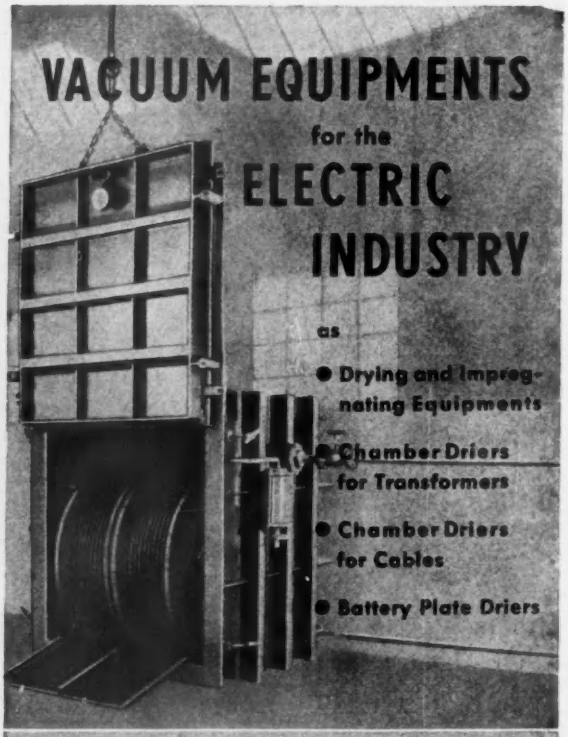
Law & Plumtree, "Glenholme", Holme Road, Matlock Bath, Derbyshire.
'Phone: Matlock 326

DaF2660ET



Haas Vakuum-Technik GmbH
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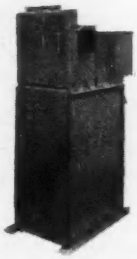
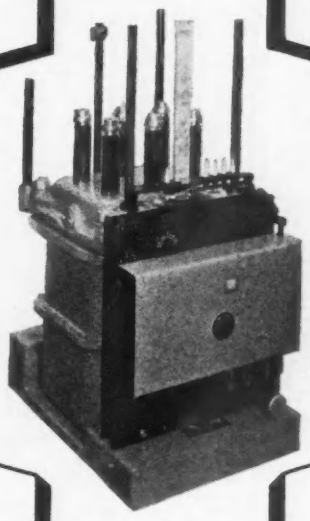
Metalclad
compound
filled FA 4
250 MVA at 11 kV.

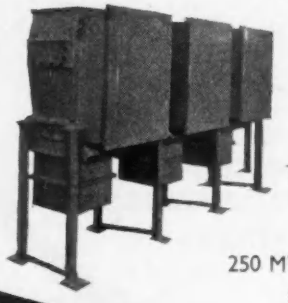


Type UA 4
metalclad
air-insulated
350 MVA at 11 kV
250 MVA at 6·6 kV.



A 4 OCB
250 MVA at 11 kV
400/800 amp.

A 6 OCB
350 MVA at 11 kV
250 MVA at 6·6 kV
400/800 amp.



Type RAO 4
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250 MVA at 11 kV
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COMPACT SPACE SAVING UNITS WITH A4 AND A6 CIRCUIT BREAKERS ON SAME DIMENSIONS

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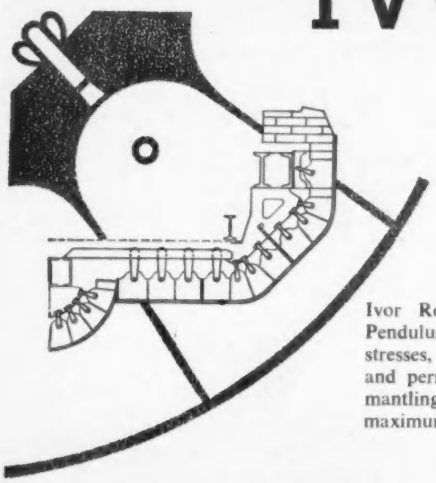
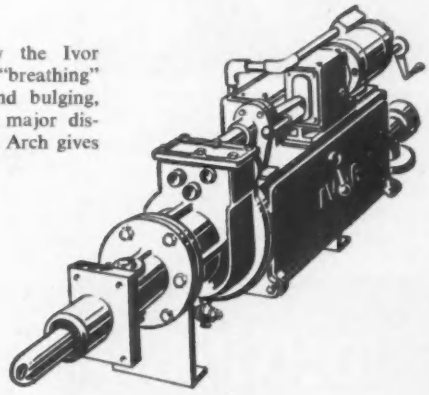
CWI7

IVOR suspended furnace arches electrically and hand-operated sootblowers to suit most types of boilers



Ivor Refractory Tiles, suspended by the Ivor Pendulum method, move freely under "breathing" stresses, resist slag attack, spalling and bulging, and permit local replacement without major dismantling. The Ivor Suspended Furnace Arch gives maximum service at minimum cost.



Clean heating surfaces and, as a result, higher boiler efficiency are most easily and economically maintained by means of Ivor sootblowers. There is a complete range to clean any part of almost any boiler. Illustrated is the Ivor Electric lly Operated Gun-type Sootblower as used in Generating Stations and large industrial Water Tube Boilers. Please ask for full information.

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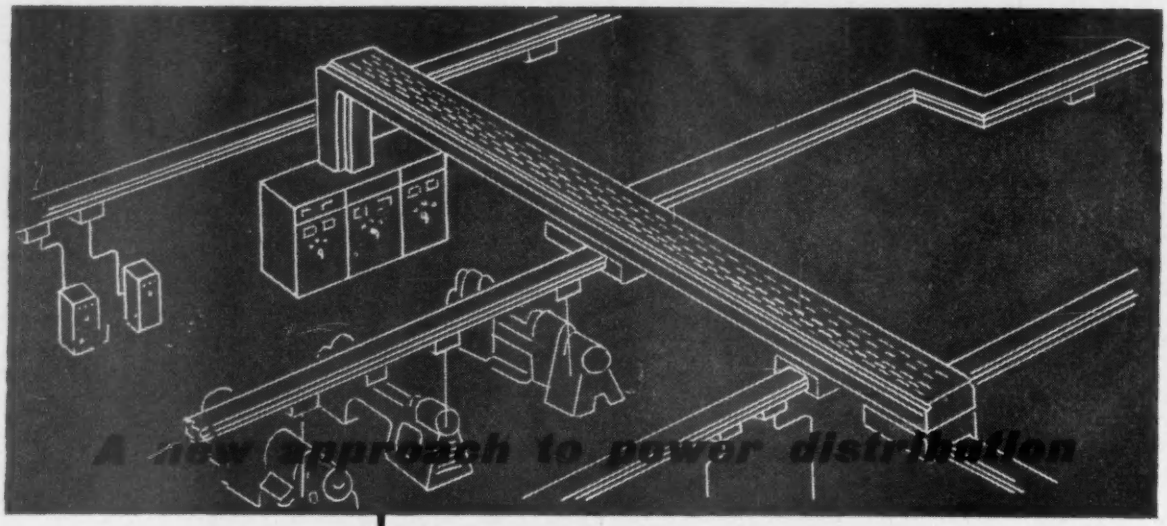
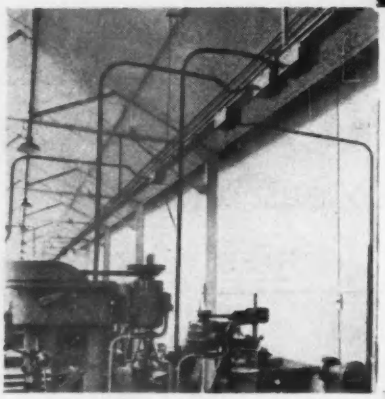


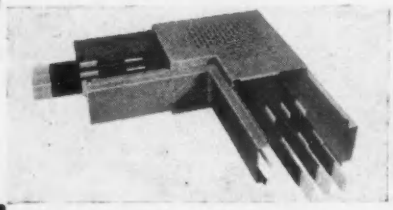
ECONOMICAL
FLEXIBLE
SAFE TAP-OFF BOXES
SILVERED CONTACTS AT JOINTS

British CANALIS BUSBAR TRUNKING

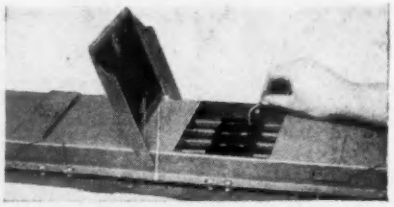


British Canalis Universal applied to workshop distribution. Tap-off boxes easily located adjacent to machine.

- HEAVY STEEL CASING.
- PLUG-IN TAP-OFF BOXES FEED SERVICE CIRCUITS AND ARE FIXED WITHOUT TOOLS.
- OPENING LID OF BOX AUTOMATICALLY DISCONNECTS FROM BUSBARS.
- CONTINUOUS EARTH BAR.
- EASY TO ERECT.



Corner section of heavy current trunking of 1,500 amps rating showing interleaved busbars.



Method of joining sections of British Canalis Universal.

BRUSH

BRUSH ELECTRICAL ENGINEERING CO. LTD. LOUGHBOROUGH

(Member of the Hawker Siddeley Group)

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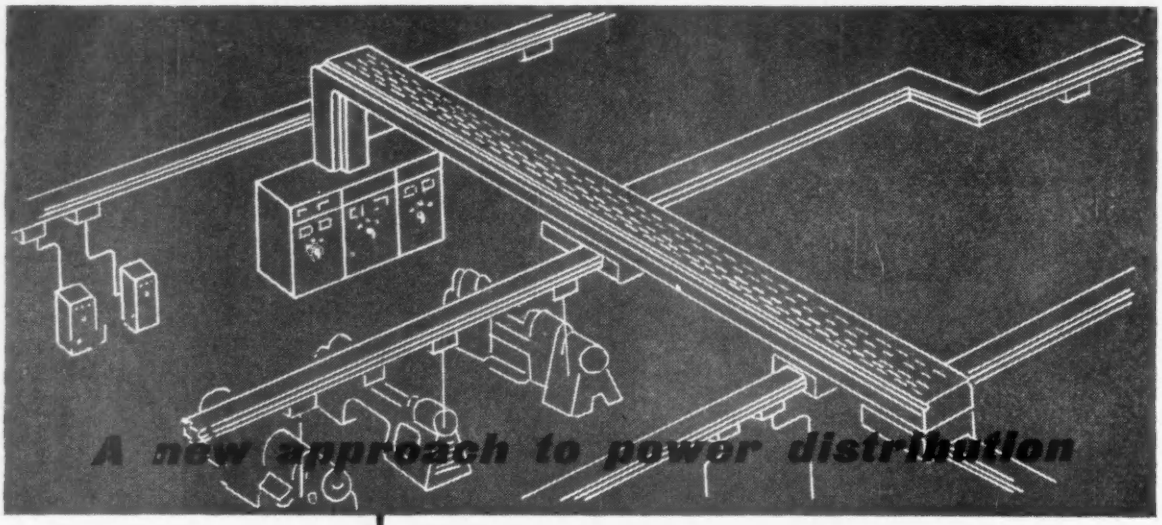

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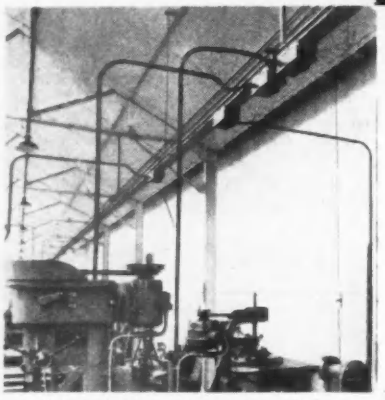

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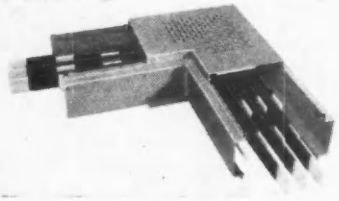

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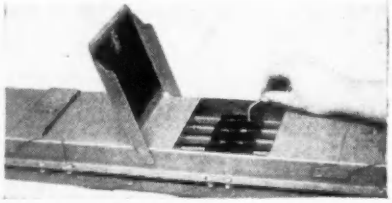

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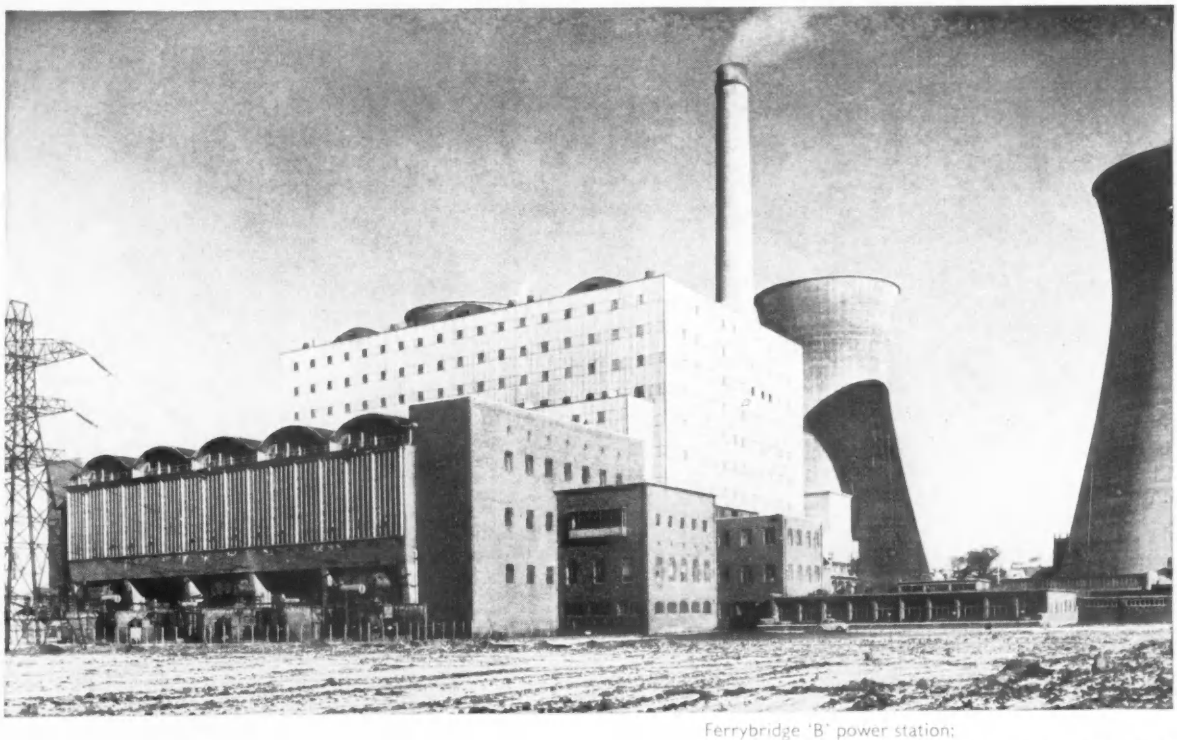
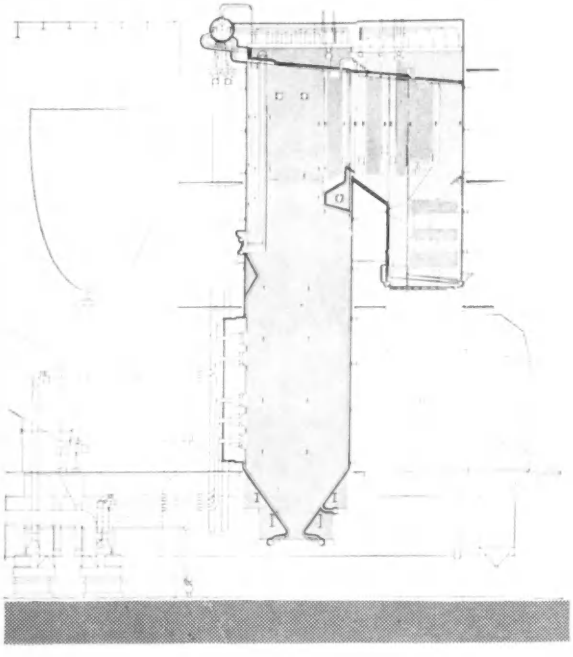
OVERSEAS—$9¼m. for electricity development in Trinidad and Tobago in 1960 . . . Bermuda approves wiring inspectorate plan . . . Australian turbo-alternator order for Sweden and 330 kV transformer order for Japan . . . CEB of Malaya investigating h.e. sites . . . Kiewa's McKay Creek power station in operation . . . Cape Town has indoor 66 kV switching station. (896-7)



Ferrybridge 'B' power station;
Yorkshire Division, Central Electricity Generating Board

BABCOCK at *Ferrybridge 'B'*

STEAM-RAISING PLANT



THREE 760,000 lb./hr., P.F.-FIRED, RADIANT-TYPE, 'REHEAT' BOILERS, steaming 100 MW GENERATORS

The Ferrybridge 'B' power station is one of the first to be commissioned of the Central Electricity Generating Board's modern "reheat" installations; with its three Radiant-type reheat boilers, all supplied by the Babcock organization and each steaming a 100 MW generator as a single boiler/turbine unit.

The boilers, each with a capacity of 760,000 lb./hr. M.C.R., at 1,600 lb./sq. in. and 985°F final temperature, with reheat to 955°F, are pulverized fuel-fired by 20 horizontal circular-type burners supplied from five Babcock type 'E' pulverizing mills, per boiler. Other Babcock equipment includes the automatic lighting-up and low-load-carrying oil burners, the automatic, sequence-controlled system of "Unidirectional-drive" and rack-type soot blowers; and Bailey boiler controls.

BABCOCK & WILCOX LTD., BABCOCK HOUSE, 209 EUSTON ROAD, LONDON, N.W.1

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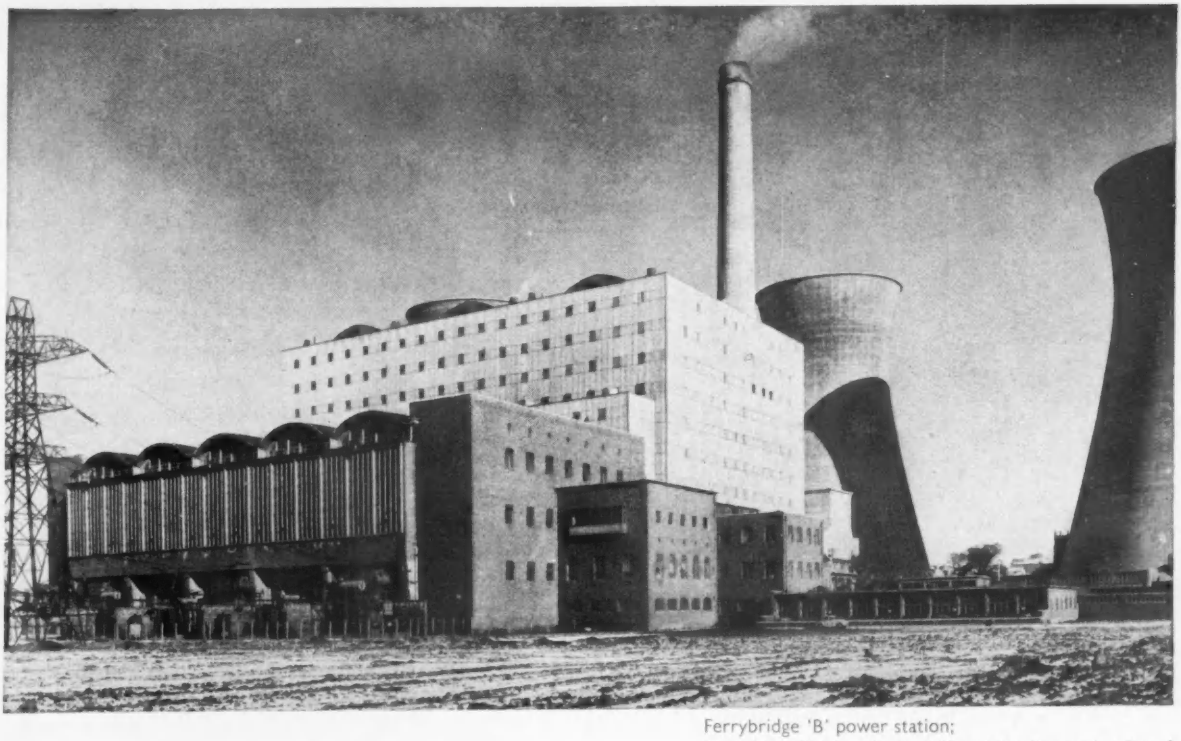
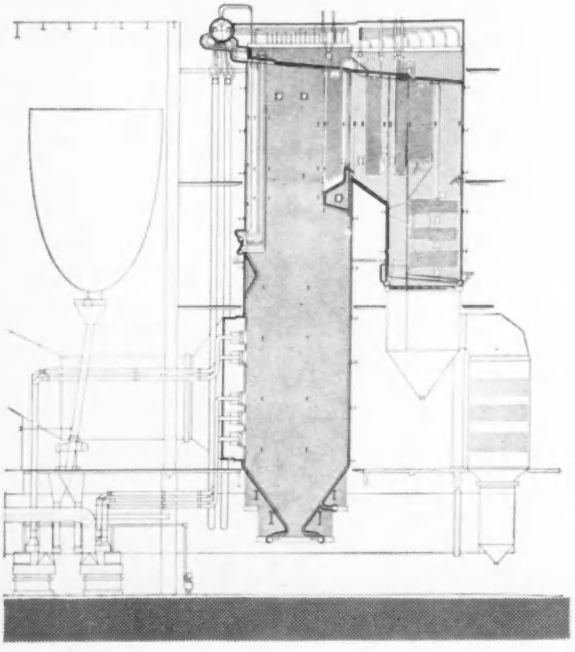
OVERSEAS—$9½m. for electricity development in Trinidad and Tobago in 1960 . . . Bermuda approves wiring inspectorate plan . . . Australian turbo-alternator order for Sweden and 330 kV transformer order for Japan . . . CEB of Malaya investigating h.e. sites . . . Kiewa's McKay Creek power station in operation . . . Cape Town has indoor 66 kV switching station. (896-7)



Ferrybridge 'B' power station;
Yorkshire Division, Central Electricity Generating Board.

BABCOCK at *Ferrybridge 'B'*

STEAM-RAISING PLANT



THREE 760,000 lb./hr., P.F.-FIRED, RADIANT-TYPE, 'REHEAT' BOILERS, steaming 100 MW GENERATORS

The Ferrybridge 'B' power station is one of the first to be commissioned of the Central Electricity Generating Board's modern "reheat" installations; with its three Radiant-type reheat boilers, all supplied by the Babcock organization and each steaming a 100 MW generator as a single boiler/turbine unit.

The boilers, each with a capacity of 760,000 lb./hr. M.C.R., at 1,600 lb./sq. in. and 985°F final temperature, with reheat to 955°F, are pulverized fuel-fired by 20 horizontal circular-type burners supplied from five Babcock type 'E' pulverizing mills, per boiler. Other Babcock equipment includes the automatic lighting-up and low-load-carrying oil burners, the automatic, sequence-controlled system of " Unidirectional-drive" and rack-type soot blowers; and Bailey boiler controls.

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This means good design and materials, the best equipment, constant inspection and extra effort on the part of everyone.

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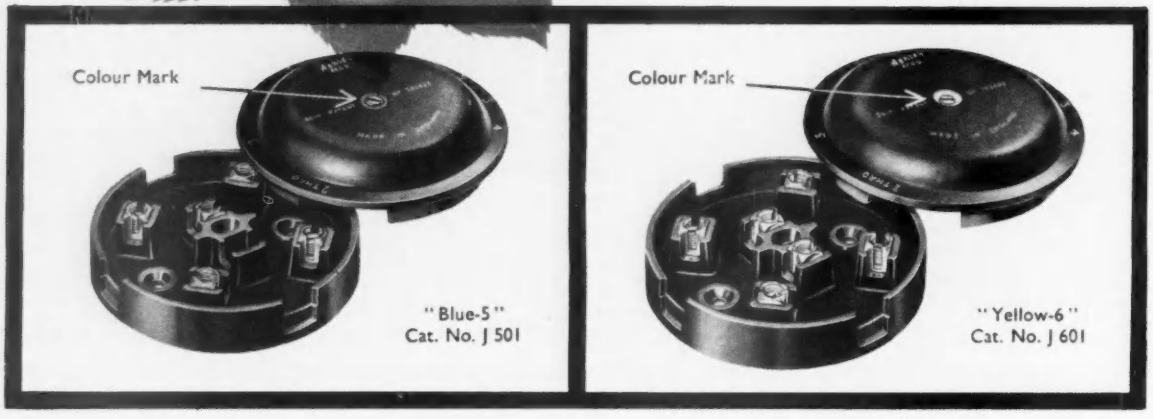

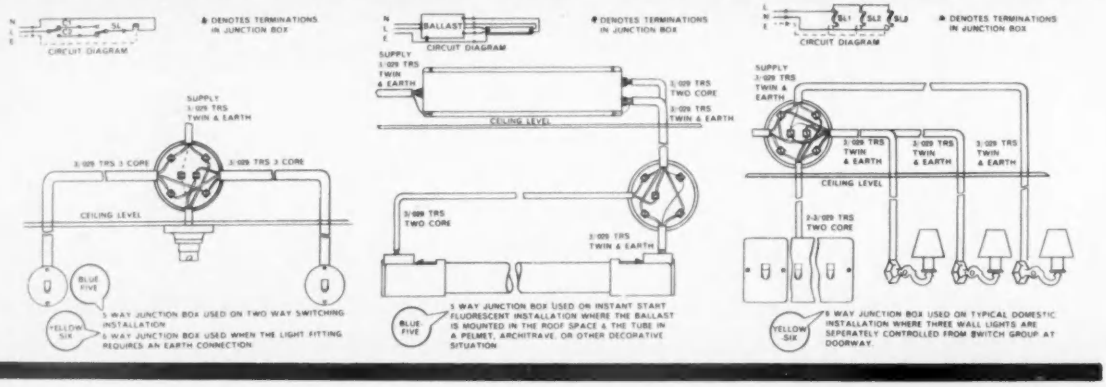
CIRCUIT DIAGRAM
* DENOTES TERMINATIONS IN JUNCTION BOX
SUPPLY 3/.029 TRS TWIN & EARTH
3/.029 TRS 3 CORE
CEILING LEVEL
BLUE FIVE
YELLOW SIX
5 WAY JUNCTION BOX USED ON TWO WAY SWITCHING INSTALLATION
6 WAY JUNCTION BOX USED WHEN THE LIGHT FITTING REQUIRES AN EARTH CONNECTION
BALLAST
3/.029 TRS TWO CORE
3/.029 TRS TWIN & EARTH
5 WAY JUNCTION BOX USED ON INSTANT START FLUORESCENT INSTALLATION WHERE THE BALLAST IS MOUNTED IN THE ROOF SPACE & THE TUBE IN A PELMET, ARCHITRAVE OR OTHER DECORATIVE SITUATION
6 WAY JUNCTION BOX USED ON TYPICAL DOMESTIC INSTALLATION WHERE THREE WALL LIGHTS ARE SEPERATELY CONTROLLED FROM SWITCH GROUP AT DOORWAY

ASHLEY 5 & 6 WAY SELECTIVE ENTRY JUNCTION BOXES

These Junction Boxes have been developed to augment our present range and are designed for use on circuits up to 20 amperes, 250 volts, and the illustrations on the left depict a number of typical applications.

It is well known that in general lighting and distribution circuits, there is often the need for one or two extra terminals, for example, when looping-in and earthing etc. In the past it has usually been necessary to employ two Junction Boxes side by side, which can be inconvenient and is always uneconomic.

Each of the four combined wiring slot/knock-outs is designed to accept, in brief terms, a range of cables from one 3/.029 twin to two 7/.029 twin and E, T.R.S. or P.V.C.—those not required can be masked by correct location of the selective entry cover.

The Junction Box covers of the 5 and 6-way types are coloured blue and yellow respectively for easy identification.

Dimensions:
Diameter 3½". Height 1 11/16". Fixing Centres 2".

Cat. No.	DESCRIPTION	Doz. List
J 501	"Blue-5" 5 Term. Brown	31/-
J 502	" " " " Cream	34/-
J 601	"Yellow-6" 6 Term. Brown	33/-
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rectifiers with transformers

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A complete range housed in ventilated sheet steel cases is available. Outputs from 50 watts to 10 kilowatts d.c. at voltages in the popular ranges 100/120, 200/250 and 400/500 volts for single- or three-phase operation are readily supplied. Write for full details and a copy of Data Sheet No. 802, to Dept. E.T.11, RECTIFIER DIVISION.

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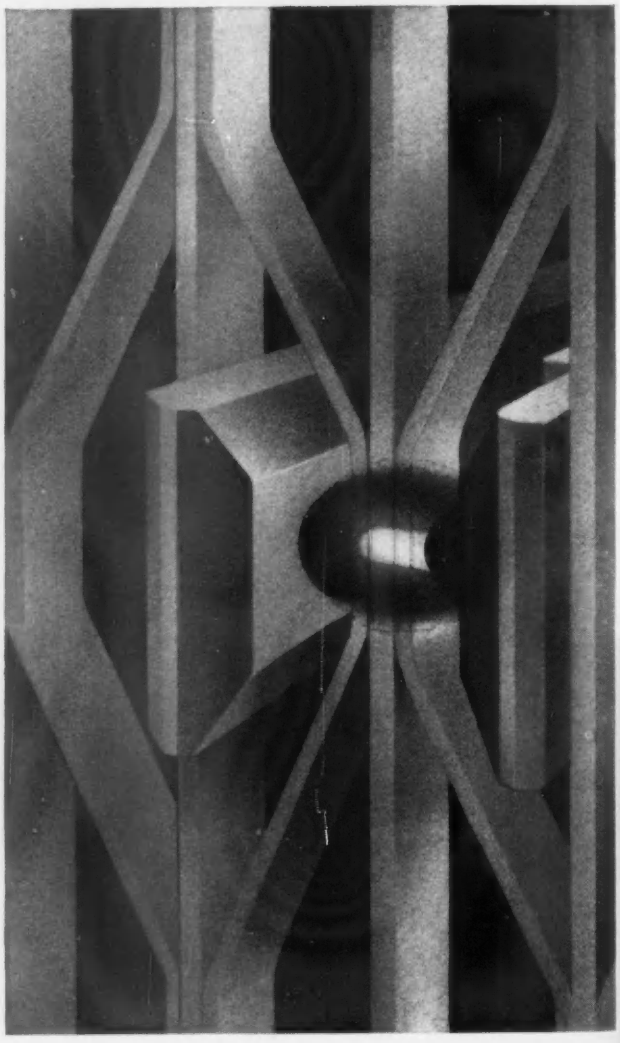
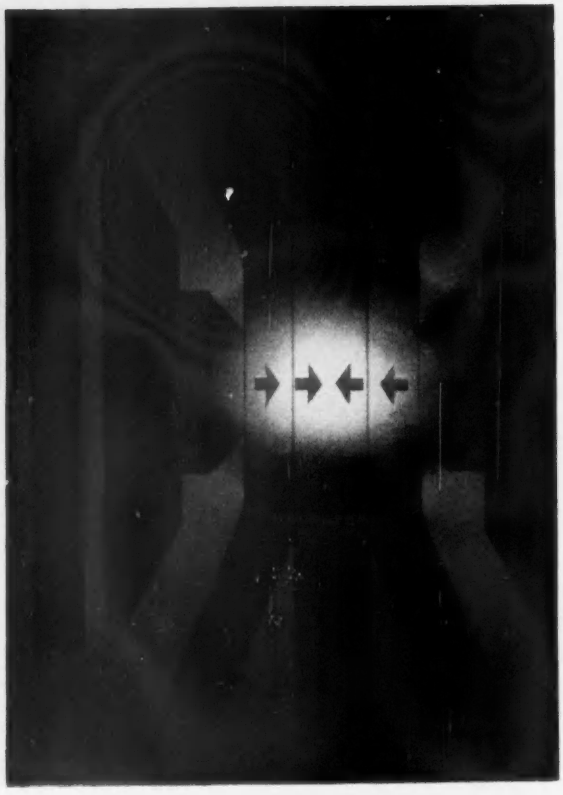


the unique SAFETREAD resistance welding method cuts corrosion



"Safetread" steel flooring is *homogeneously resistance welded under pressure*—thus closing the grain of the material and providing a highly corrosion-resistant joint of great strength. "Safetread" floors installed for many years under rigorous conditions show that the least corrosion has taken place at the point of welding. Welded through the neutral axis of the main bar, maximum strength and lateral stability is also gained.

Engineers everywhere specify "Safetread"—its unique design and construction give greatest strength and rigidity with a minimum of weight which enables valuable economies to be effected in supporting members. "Safetread" is tailor-made to your specification no matter how intricate the layout. **WRITE TO-DAY** for the "Safetread" catalogue—it's a mine of information including deflection tables, safe load tables, etc., a valuable work of reference for the man with a flooring problem.

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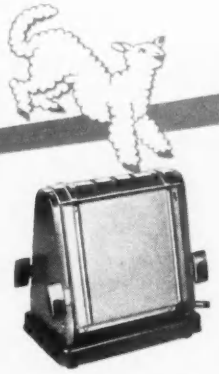
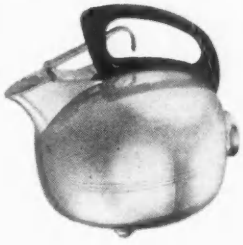


TOASTERS



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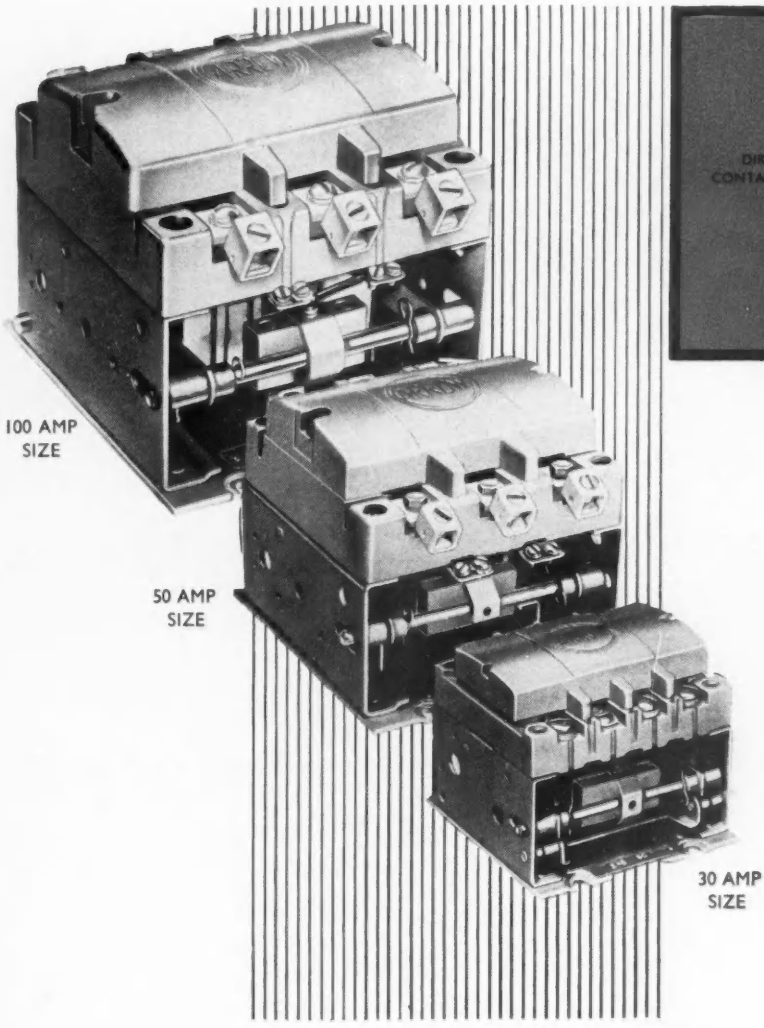

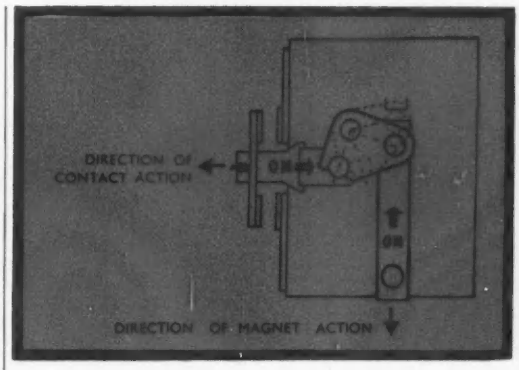

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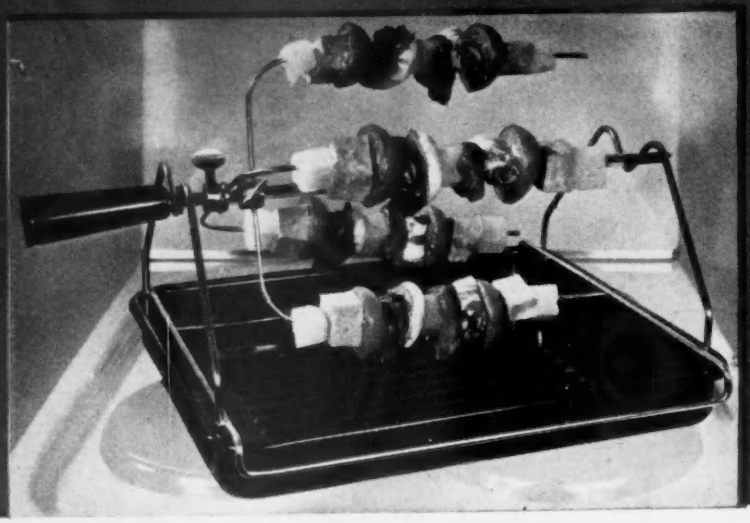

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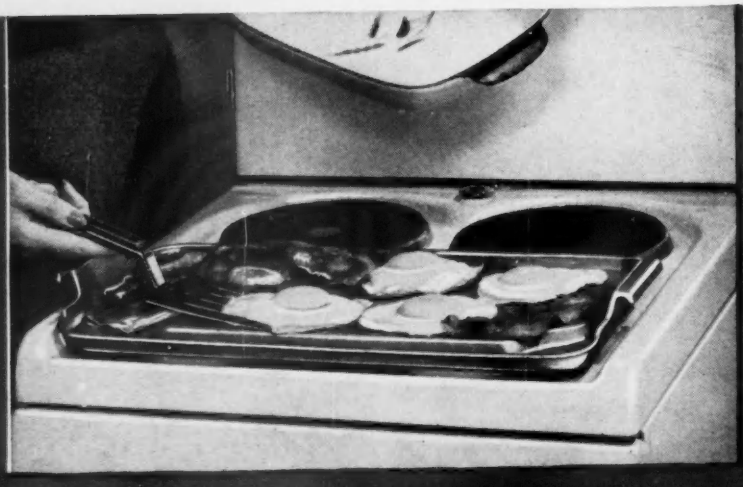

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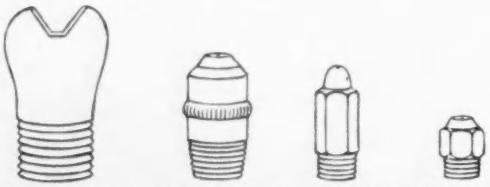

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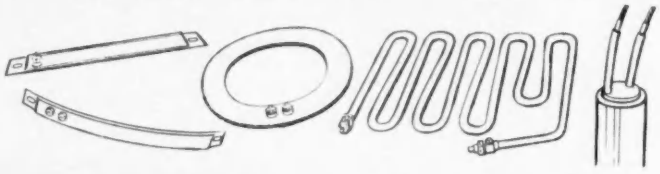
a bit of



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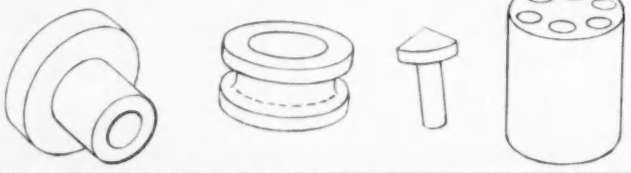

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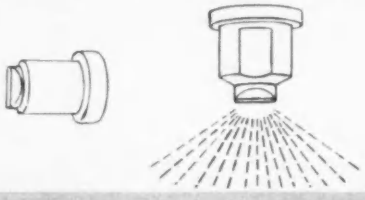

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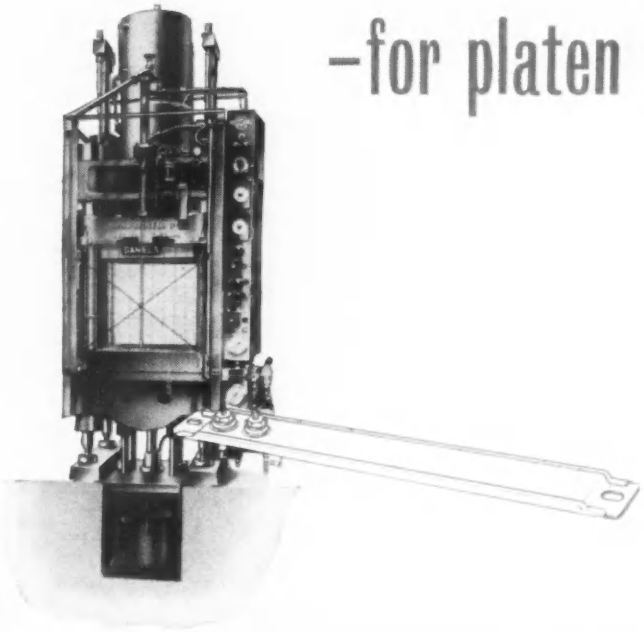

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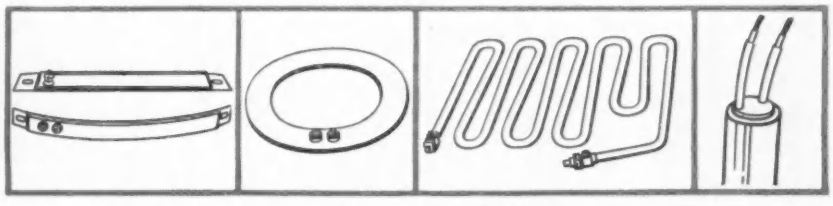
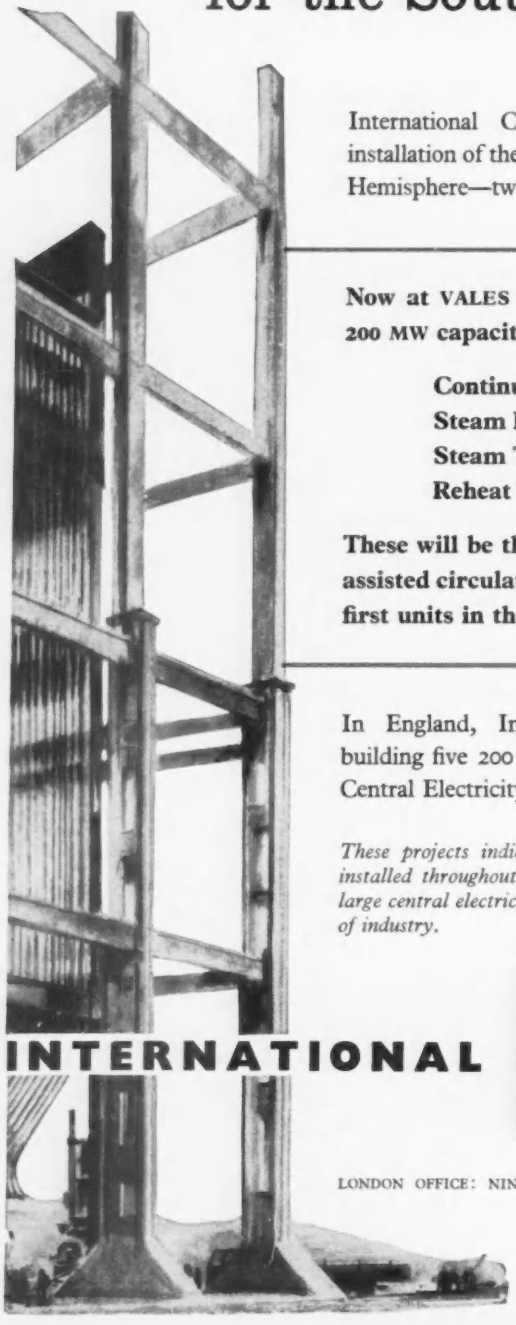


ELECTRIC HEATING ELEMENTS of standard strip, ring, tubular and cartridge elements

GEO. BRAY & CO. LTD., LEICESTER PLACE, LEEDS 2. TELEPHONE: LEEDS 35399 TELEX: 55186

The International Combustion Organisation secures the contract for the LARGEST STEAM GENERATING UNITS for the Southern Hemisphere



International Combustion were responsible for the installation of the first 100 MW boiler units in the Southern Hemisphere—two units at TALLAWARRA, Australia.

◀ 100MW

Now at VALES POINT, Australia, two IC boilers of 200 MW capacity are to be installed:—

Continuous maximum rating: 1,350,000 lb/hr
Steam Pressure: 2,450 lb/sq. in.
Steam Temperature: 1,055°F
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These will be the first high capacity controlled and assisted circulation boiler units in Australia and the first units in the country to employ a reheat cycle.

◀ 200MW

In England, International Combustion Limited are building five 200 MW units and one 550 MW unit for the Central Electricity Generating Board.

◀ 550MW

These projects indicate the confidence placed in IC equipment installed throughout the world, meeting the requirements both of large central electricity generation and the specialised applications of industry.

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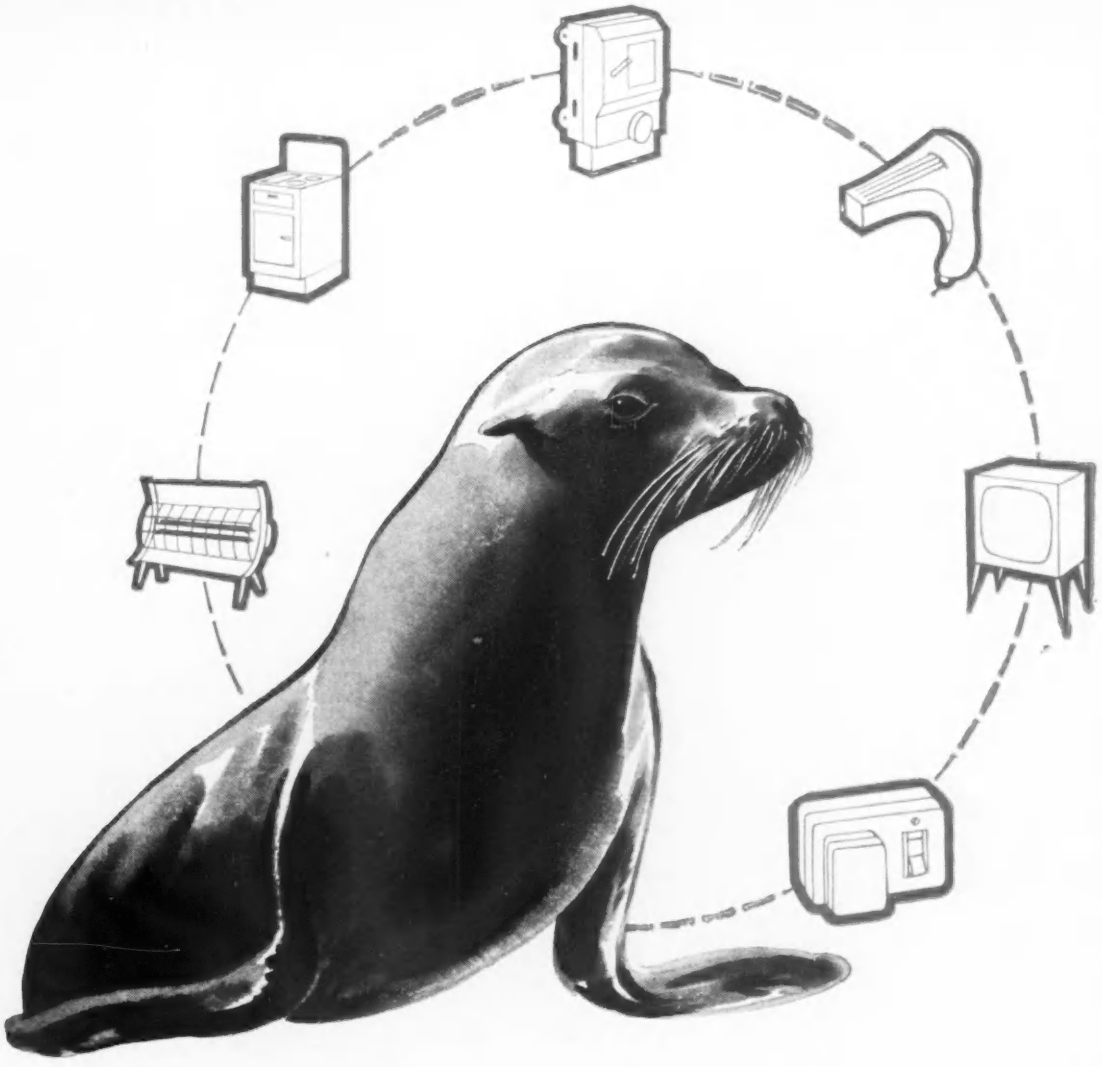

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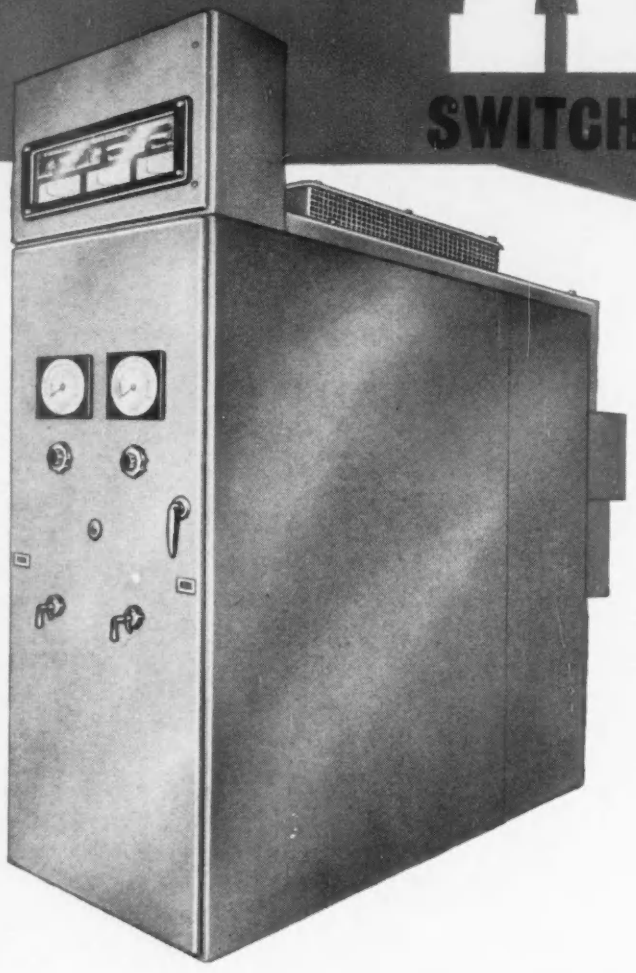
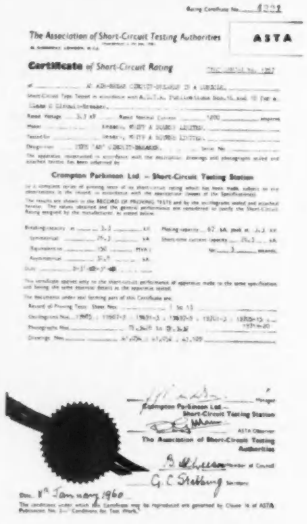
Air Insulated Air Break TYPE AH SWITCHGEAR UNIT

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3.3 kV. 150 MVA

The newly designed Type "AH" Switchgear Unit is air insulated and embodies an Air Break Circuit Breaker which has been certified for a Rating of 150 MVA at 3.3 KV in accordance with A.S.T.A. Requirements 16 and 18.

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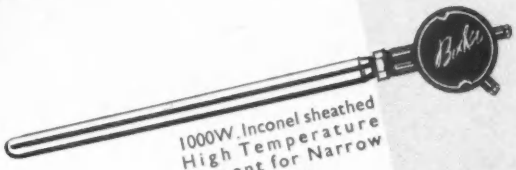
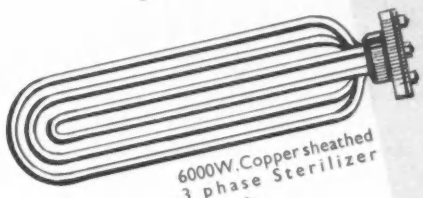
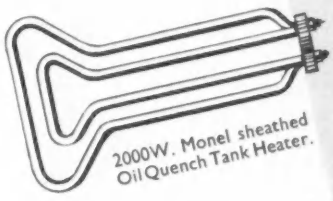


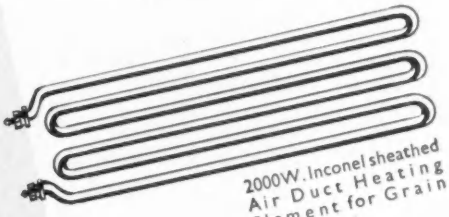
1000W. Inconel sheathed High Temperature Element for Narrow Band Radiation.



6000W. Copper sheathed 3 phase Sterilizer Element.



2000W. Monel sheathed Oil Quench Tank Heater.



2000W. Inconel sheathed Air Duct Heating Element for Grain Drying Plant.

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"MEMREX-EXEL" 500 volt Switchgear

PRESSED STEEL ENCLOSURES
FOR LIGHTNESS AND STRENGTH.
FRONT OPERATING SWITCH HANDLES.
REWIRABLE OR H.R.C.

10—15—30 Amp. Switches
10—15—30—60 Amp. Switchfuses.

This new range of "Memrex-Exel" switchgear provides the most up-to-date and technically advanced range of 500 volt industrial switchgear yet offered to industry.
Modern styling, sound technical performance and compliance with all relevant British Standard Specifications are basic essentials. The range complies with the most strict interpretation of I.E.E. Regulations (13th edition), and with the requirements of The Electricity (Factories Act) Special Regulations.

Features include

Cases of one piece pressed steel with hinged covers, rustproofed and finished light grey stove enamel.

Front operating switch handles improve appearance and permit more compact assemblies on switchboard and panels.

Fuses are of the new "Kantark-Exel" pattern which will accept rewirable or H.R.C. fuses.

Semi-enclosed rewirable (damper type) patterns comply with B.S.3036 : 1958.

H.R.C. cartridge patterns which are interchangeable with semi-enclosed rewirable patterns, comply with B.S.88:1952, Appendix 'J' Dimensions.

M.E.M. H.R.C. cartridge fuse carriers are designed to accommodate H.R.C. cartridge fuse-links made to B.S.88 : 1952, Appendix 'J' Dimensions, Form A—Offset Tags.

M.E.M. H.R.C. cartridge fuse-links are available for use with this range of switchgear. All ratings have been A.S.T.A. certified for Categories of Duty 440 A.C.3 (16,500 amps), 440 A.C.4 (33,000 amps.) and 440 A.C.5 (46,000 amps.).

"Memrex-Exel" switches comply with the relevant Temperature Rise and Making and Breaking Capacity Tests of B.S.861: 1955 and B.S.2510: 1954.

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The new company is making a complete range of cables insulated with rubber, thermoplastics and impregnated paper. Telephone cables are not included in the manufacturing range of the new company.

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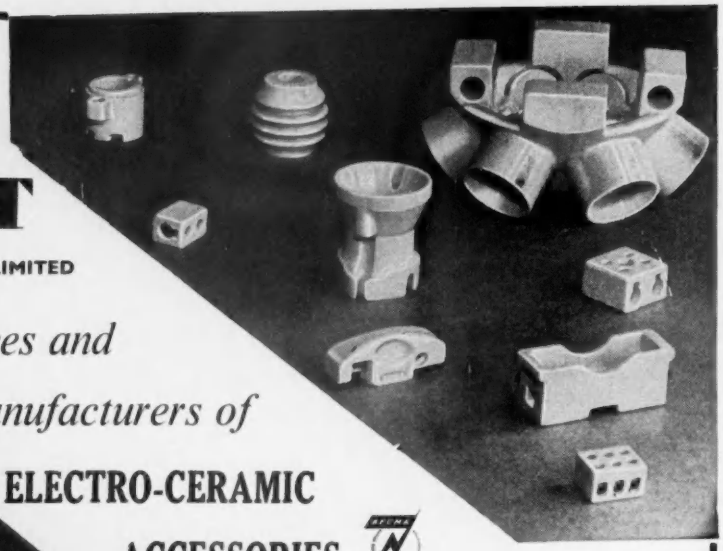

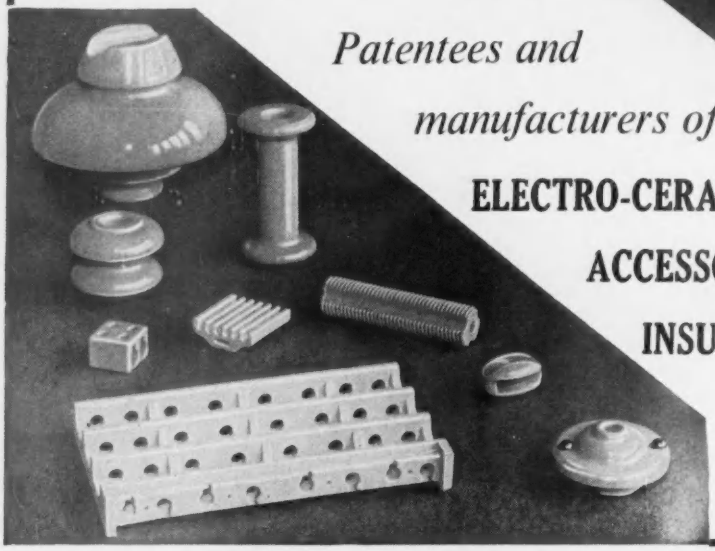

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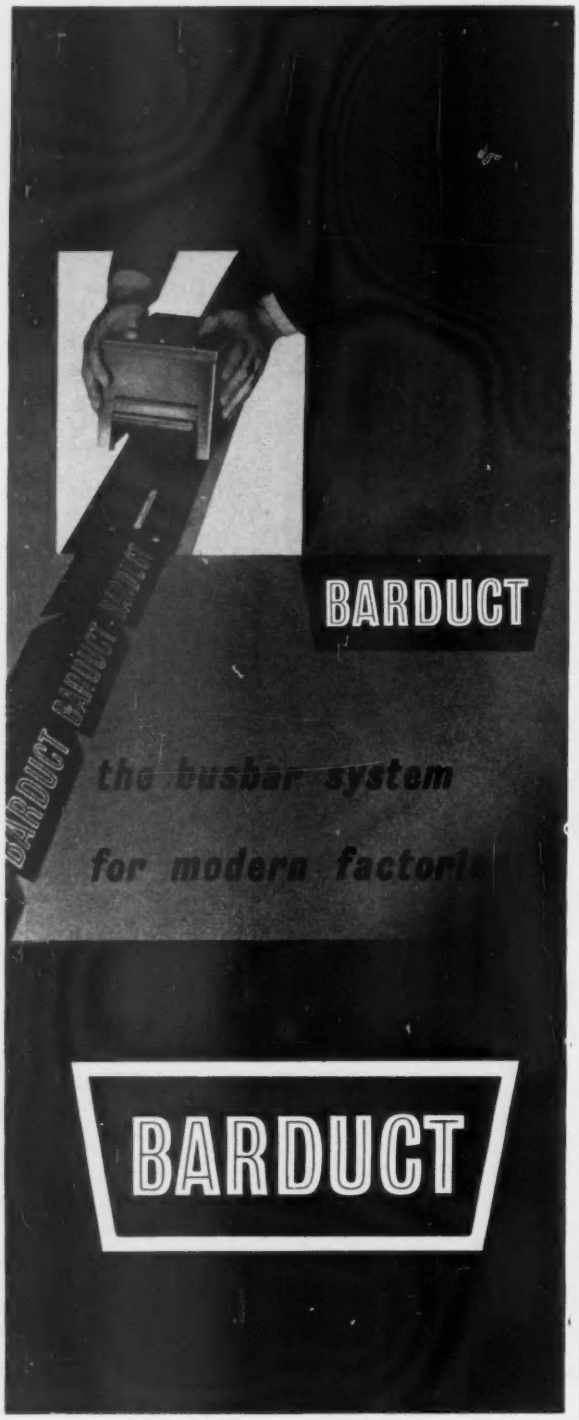

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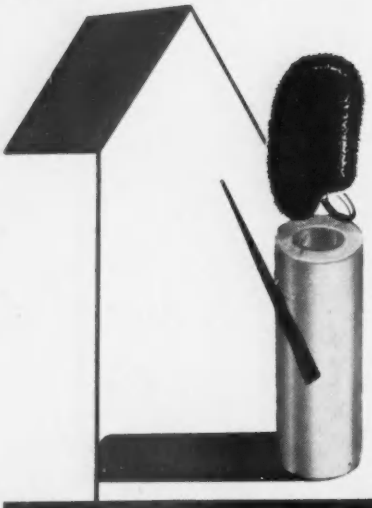

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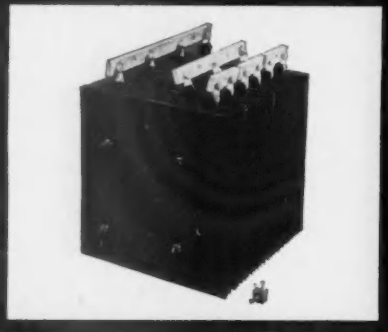

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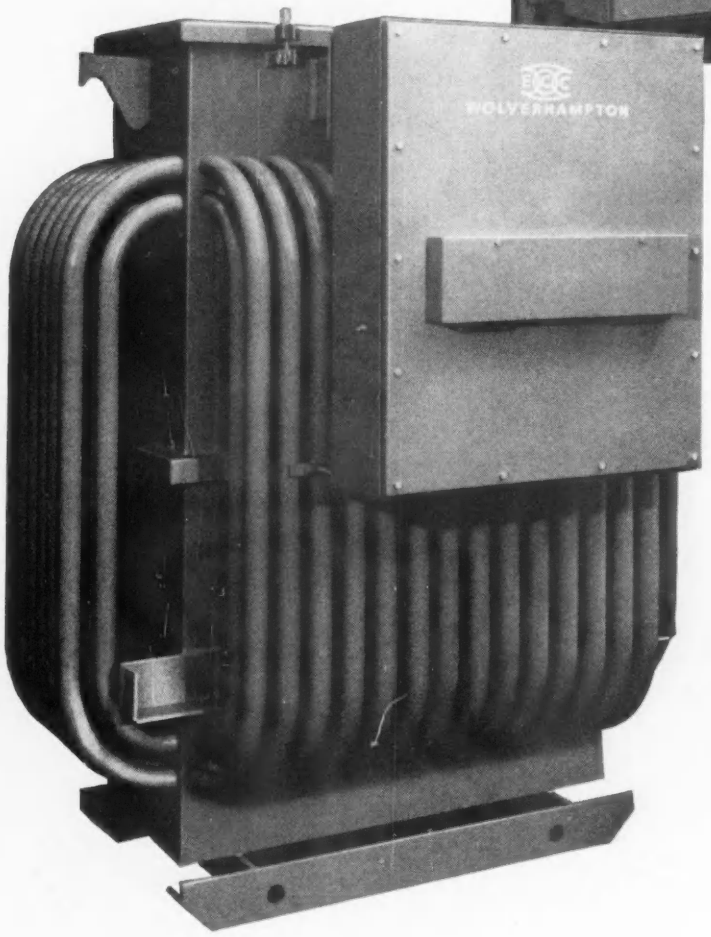

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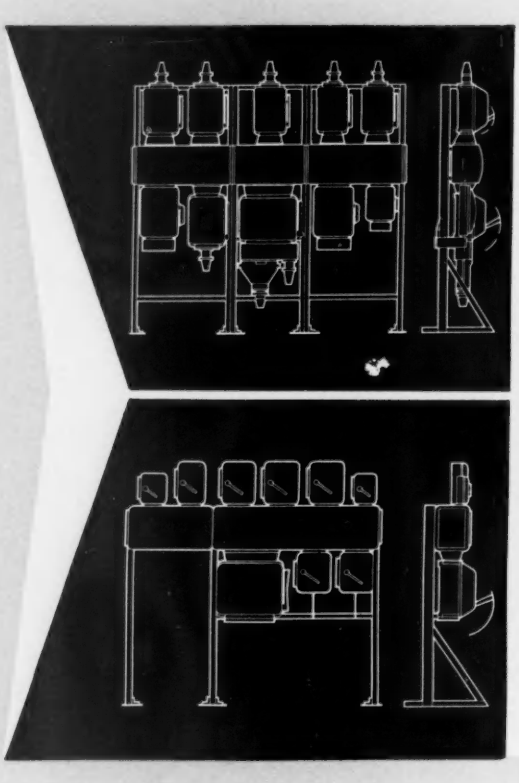

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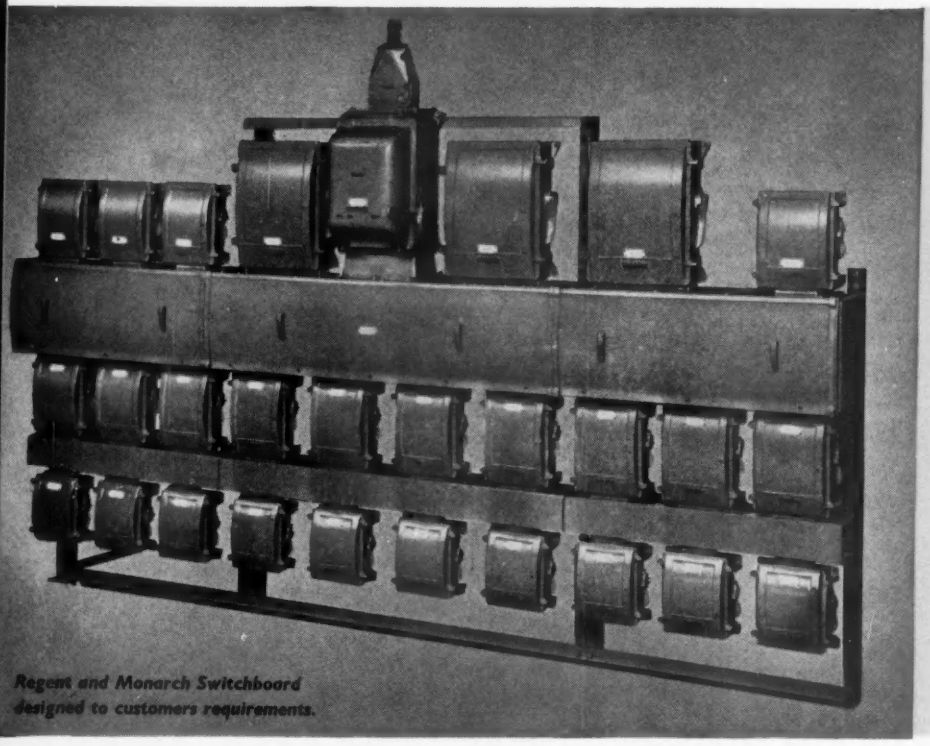

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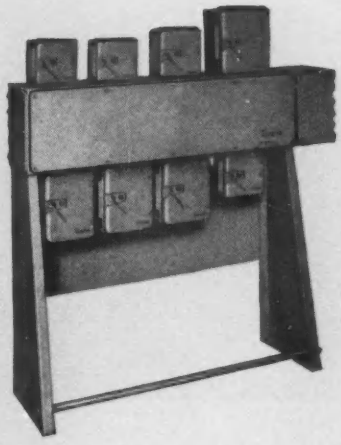

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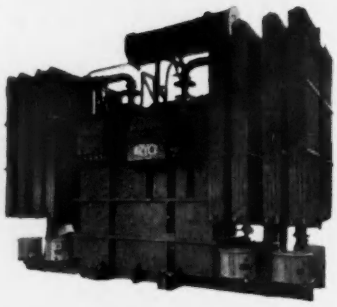

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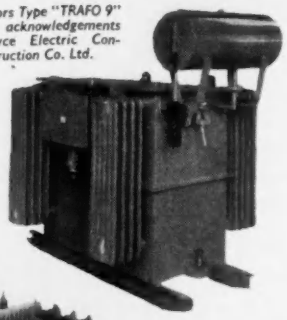

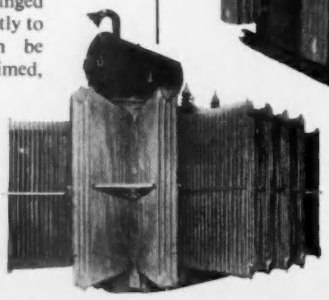

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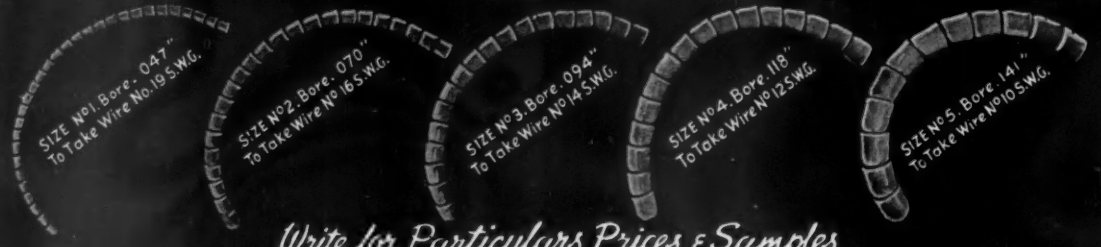
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Also for use on 50 volts mains supply.

Average lamp life 5000 hours

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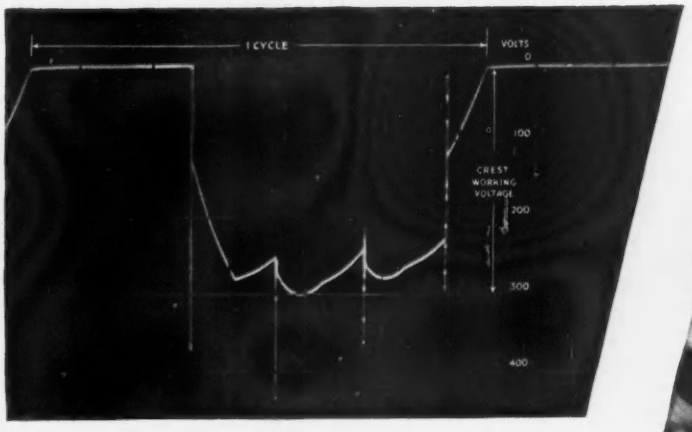
Crest working voltage 300 volts



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A new Grommet development

THE DOUBLE SEALING EMPIRE RUBBER GROMMET

infinitely accommodating in use:
considerably reduces range of sizes
because the same grommet can be used with
several plate thicknesses or cable sizes

PAT. APP. No. 5255/59

This newly developed self-conforming grommet, because it is immediately self-locking against the elements, is the solution to many of an engineer's sealing problems.
Any one size will not only accommodate itself to a variety of mounting plate thicknesses, but (designed for cable or control rod) will take these in a variety of sizes and be weather-, water- and dust-proof at a variety of angles to the cable or rod.

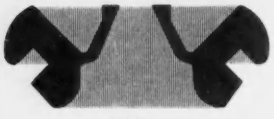
Because of its capacity to conform to many varying requirements, it enables a workshop stock range of grommets to be reduced to perhaps one tenth of that at present maintained.

THE NEW BLIND GROMMET

FREE

Note how when sprung into position the grommet provides a perfect double seal by its own permanent pressures. The angled groove also creates a tight pressure hold on the metal plate.

THE NEW DESIGNED GROMMET



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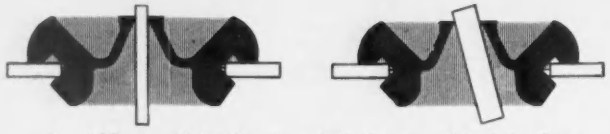
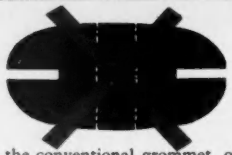
FITTED

In the cable grommet variety the same double pressure seal is created, allied to tight seal on various diameters of cable. This new grommet gives sound sealing at *all* vital points.



A useful feature of this cable grommet is that by reason of the designed taper of the cable entry and the flexibility of the web, a considerable angle of cable entry and a variety of cable size are possible. This avoids necessity for special grommets with angled bores.



In the conventional grommet, only one thickness of plate and only one size of cable can be accommodated. No effective seal is afforded by the parallel groove.

Now being produced in a range of sizes.

THESE GROMMETS WILL SOLVE YOUR SEALING PROBLEMS.

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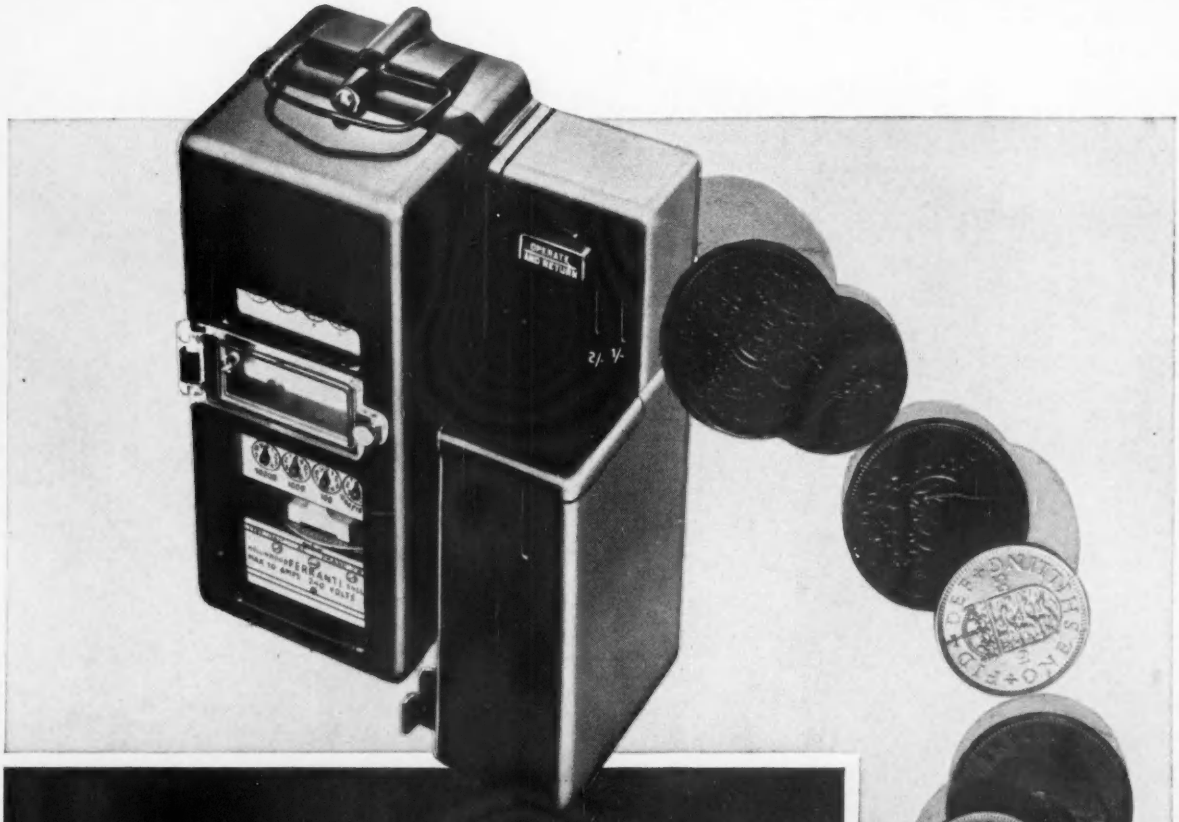

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FMmP PREPAYMENT METER

For optional or single coin use

a

b

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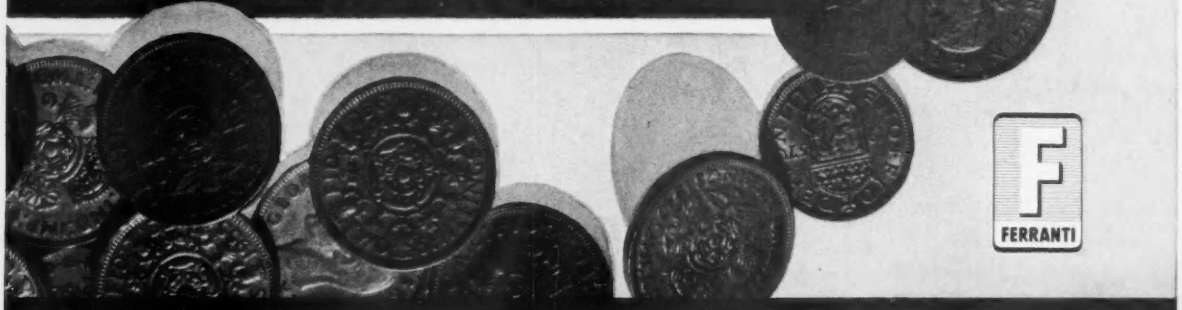

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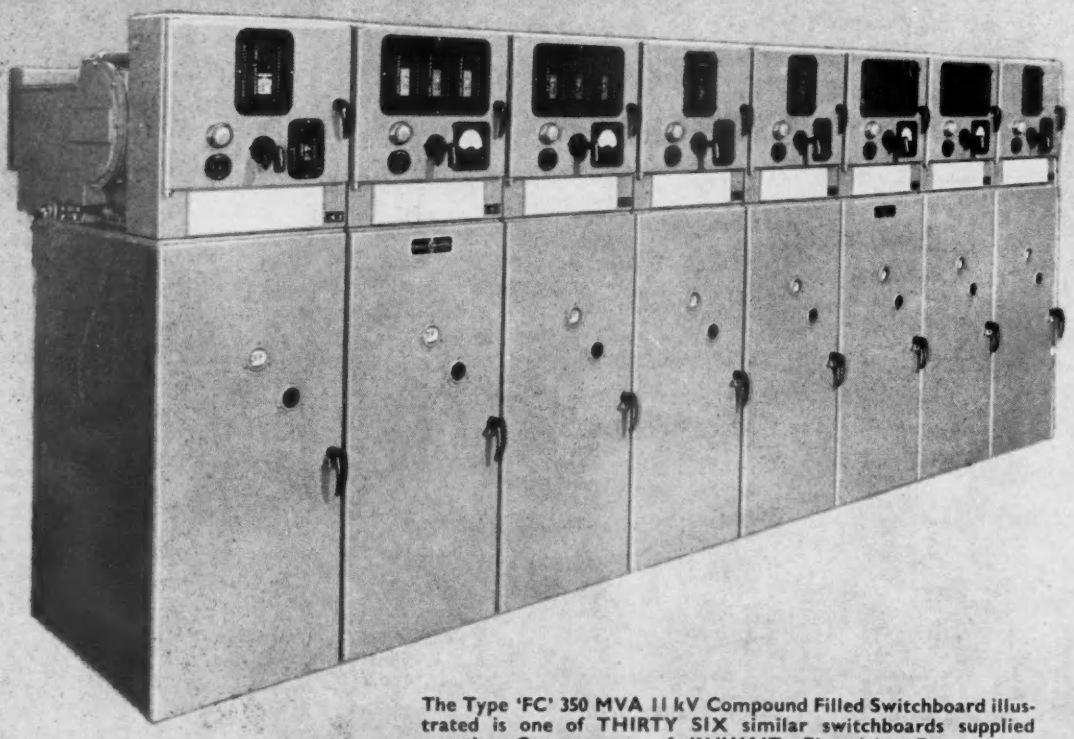

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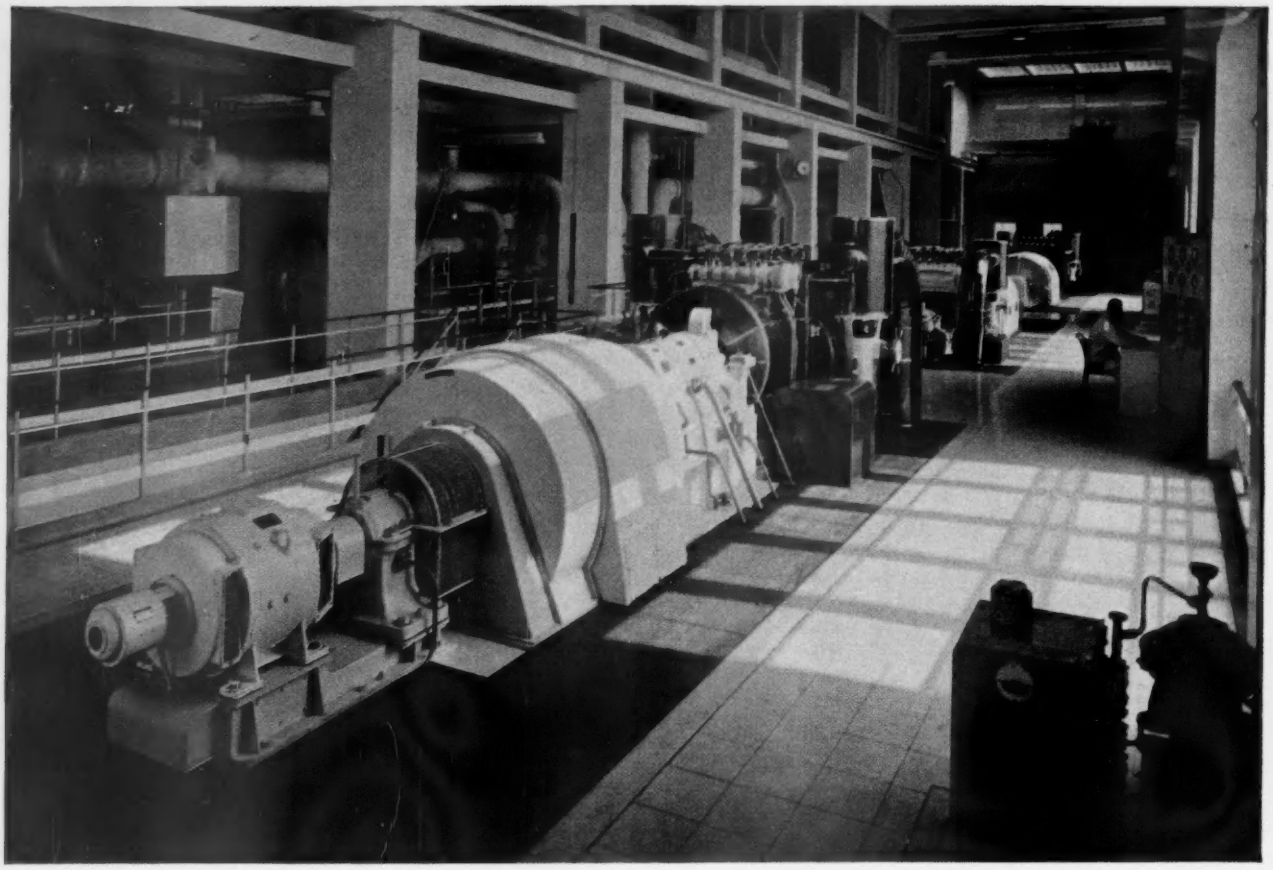

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They are driven by the steam generated for process work and, operating in parallel with the National Grid, provide the electricity for the factory, helping to minimise overall fuel costs.

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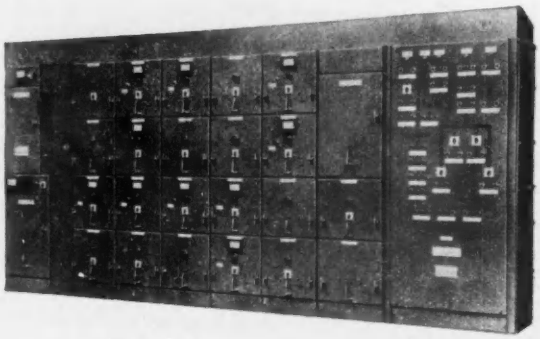

MOTOR STARTER BOARD & CONTROL PANEL

Typical of Starter Boards for use in material handling plants where machines require to be started in sequence by semi-skilled operators.

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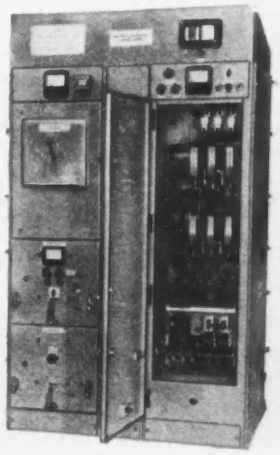
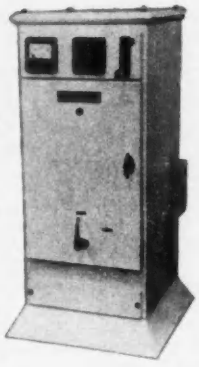
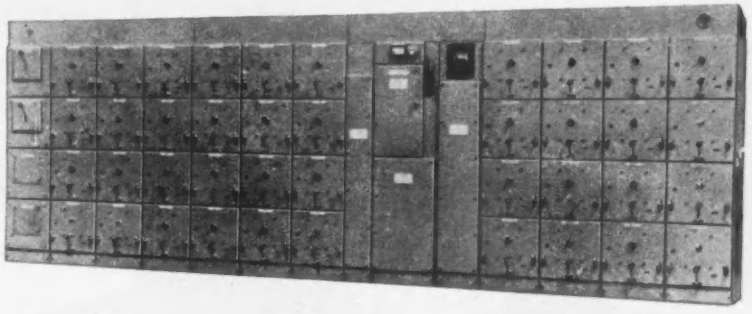
Tipplers and similar machines requiring reversal are frequently controlled automatically or semi-automatically. This unit is for semi-auto operation of a 60 h.p. Tippler with Thruster Control built into the main starter.



CIRCUIT BREAKER DISTRIBUTION SWITCHBOARD

Medium voltage Circuit Breakers required for distribution are available in Two Tier formation as shown, up to 300 amps. Earth Leakage and other features may be incorporated.





DISTRIBUTION PILLAR UNIT TYPE D.59

Circuit Breaker Units are available as shown, together with a range of Motor Starters. These units can also be supplied in Switchboard formation.

MOTOR STARTER CONTROL BOARD

Chemical processes, etc., requiring control at the apparatus frequently call for Control Gear located away from the plant. This is typical of Units supplied for this purpose.

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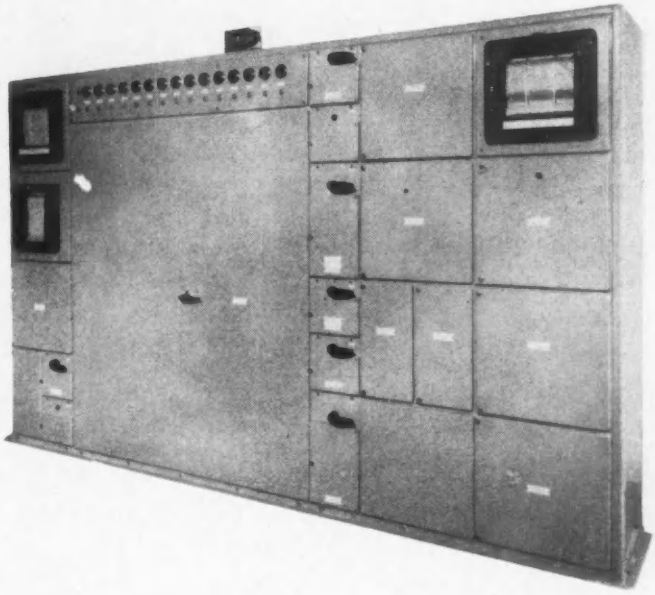

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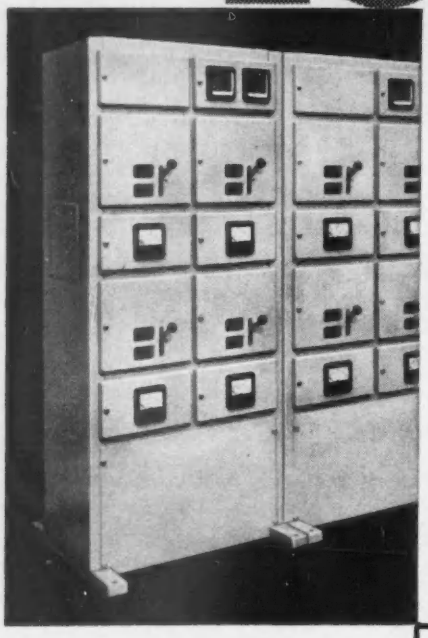

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THURSDAY 2 JUNE, 1960
Registered as a Newspaper Volume 137 No. 22

ELECTRICAL TIMES

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2
Telegrams: Equivolt . Estrand Telephone: HOLborn 6016

Dans ce numéro

Réduction de la demande en MW aux heures de pointe 877

Une indication minute-par-minute de la demande totale en MW, imposée par l'autorité chargée de la distribution dans la région sud du Pays de Galles sur le système britannique de génération et de transmission, est une caractéristique d'une salle de contrôle d'un réseau de distribution terminé récemment. L'ingénieur chargé du contrôle est en mesure de réduire la demande maximum taxable sur un total de 27 sous-stations principales, en requérant certains gros usagers de diminuer leur demande de courant, à court préavis. Les usagers qui sont disposés à accepter de telles requêtes sont taxés suivant des tariffs particulièrement intéressants.

Convention britannique de l'énergie électrique ... 883

Des communiqués lors des conférences principales de toutes les branches de l'industrie britannique de constructions électriques traitent des perspectives pour les 20 années à venir, et même plus. Il est suggéré que la limite actuelle de puissance d'un turbo-alternateur mono-arbre est de 600 MW, mais que des groupes de turbo-alternateurs 2.000 MW cross-compound à deux lignes d'abres pourront peut-être entrer en service vers 1970. Les transformateurs sont limités à environ 500 MVA du fait des difficultés de transport; autrement des transformateurs de 2.000 MVA triphasés pourraient être construits, s'ils étaient requis. Le programme d'installation pour l'Angleterre et le Pays de Galles prévoit des tailles standard allant jusqu'à 550 MVA, dans un avenir prochain.

Câbles en matière plastique en Australie 901

Des câbles isolés au C.P.V. sont utilisés en Australie pour faciliter l'installation souterraine à bon marché, de circuits jusqu'ici sous forme de lignes aériennes.

In dieser Nummer

Begrenzung des Spitzen-MW-Verbrauchs 877

Durch die Errichtung eines neuen Kontroll- und Kommandoraums für des Verteilungsnetz im Versorgungsgebiet von Südwales wird u.A. eine laufende Ueberwachung und Anzeige des gesamten MW-Bedarfs ermöglicht, den die Stromversorgungsbehörde in Südwales vom britischen Stromerzeugungs- und Verteilungssystem beansprucht. Der diensthabende leitende Ingenieur ist ermächtigt, den gebührenpflichtigen Gesamtbedarf der im Gebiet liegenden Hauptunterwerke (gegenwärtig 27 an der Zahl) planmässig zu begrenzen, indem er gegebenenfalls eine Anzahl Grossabnehmer auffordert, ihren Stromverbrauch entsprechend einzuschränken. Verbraucher, die sich bereit erklären, die Verpflichtung zur Befolgung solcher Anweisungen auf sich nehmen; erwerben damit den Vorteil, Kraftstrom zu einem begünstigten Tarif zu beziehen.

Britische Konvention für die Starkstromtechnik ... 883

Auf den Hauptversammlungen sämtlicher Interessengruppen der britischen Starkstromindustrie vorgetragene Referate besprechen die Aussichten für die Industrie in den nächsten zwanzig Jahren. Die Ansicht wird vertreten, dass 600 MW die derzeit gültige obere Leistungsgrenze für einwellige Turboalternatoren darstellt, dass aber zweiwellige Verbundsätze mit einer Leistung bis zu 2000 MW noch in den siebziger Jahren dieses Jahrhunderts verfügbar sein dürfen. Transformatoren sind durch die gegebenen Transportbedingungen auf einer Maximalleistung von etwa 500 MVA beschränkt, sonst könnten erforderlichenfalls Drehstromtransformatoren mit einer Einzelleistung von 2000 MVA ohneweiteres gebaut werden. Der Kraftwerkbauplan für England und Wales sieht in der unmittelbaren Zukunft den Bau von Sätzen mit einer Einzelleistung bis zu 550 MW vor.

Kunststoffumhüllte Kabel in Australien 901

Mit Pe-Ce-Kunststoff isolierte Kabel werden gegenwärtig in Australien verwendet u. zw. im Zuge der Bestrebung, Netzleitungen, die bisher oberirdisch errichtet wurden, mit geringem Geldaufwand in die Erde zu verlegen.

Control in South Wales 877

A Nuclear Ampere 881
by W. Gosling, B.SC., A.R.C.S.

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ELECTRICAL
TIMES

ESTABLISHED 1891

THURSDAY, 2 JUNE, 1960

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Comment

LIMITS TO COMPETITION

Competition, said Lord Chandos in his presidential address to the British Electrical Power Convention, is a necessary ingredient of a lively economy. Once having said that, he went on to indicate strong conviction that it is far from being the essence of successful trading in the heavy electrical industry. One of the important features in his imaginative review of the industry, was the call for manufacturers to co-operate more closely; to get together to offset the growing power of the large customer, which feeds so rabidly on competition in a restricted market. Viscount Chandos is far from being alone in this approach; Mr H. G. Nelson is outspoken in his paper of the need for closer co-operation since free competition in the classical sense is no longer realistic, and not surprisingly, Mr E. V. Small has thoughts along similar lines. Outside the confines of convention papers, industry is feeling its way in this direction. With some pause apparent in take-over progress so far as the largest firms are concerned, there seems to be an upsurge of agreements to co-operate in research and development, in exchange of information, or in meeting large packaged orders for technical plant for use overseas. In this way the electrical industry is working out some partial answer to the problem of living with the Restrictive Trade Practices Act (which has a saving clause with respect to exports, it must be recalled). With the heavy demands on investment that are imposed by the will to reach the horizons of development which the convention authors have scanned, there is about this move to co-operate through mutual understanding, if not by legally enforceable agreement, the mark of far-thinking that is to be expected of the leaders of an industry so important to Britain's future both at home and overseas.

ALL-ELECTRIC NEEDS

If the electrical industry really believes in an all-electric future for the British home then it has some rethinking to do about the standards of service it offers. That conclusion stands out clearly from the realistically argued paper in which Mr T. E. Daniel maps out the domestic electrification horizon. Some of his thinking may strike readers as fanciful—his warning that a 25 amp domestic plug and socket is an early requirement, for example. Yet in that case, there is ample evidence in support to be gained by travel across the Channel, where 5 kW and 7 kW appliances fed single-phase are being offered by numbers of manufacturers. It is to such an aggregation of loads that the supply industry must look and we would support Mr Daniel's argument that it is short-sighted to show reluctance to connect today's all-electric housing estates. If such planned provision is shrugged off, there will still

be the piecemeal growth of the future to face with distribution systems less able to match the consumers' demands. Away from hardware, too, the probabilities of the future require a new look. In Mr Daniel's paper there are two types of service which are marked for early improvement. One is continuity of supply and—more troublesome—adequacy of voltage at all times. What can pass in the partially electrified home of today will not be acceptable for the one-fuel dwelling that promises to be the norm of the next decade. The other is manufacturers' servicing of their appliances; or rather, the provision of some inexpensive alternative, to avoid having half a dozen or more regular callers on the well-equipped housewife. The need here is for some sort of maintenance contract to be evolved which will cover all the electrical equipment in a house, and preferably the wiring as well, so far as regular test and adjustment is concerned.

NEW OUTLOOK FOR E.R.A.

Trouble-shooting for the electrical industry. That is the aim of the Electrical Research Association, now in the throes of some reorganisation and much hard thinking to adjust itself to the realities of the commercial conditions of the 1960s. The survey of the newly forming policy of the Association, which is a feature of this issue, is based on exclusive interviews with senior ERA staff and it throws into relief the most radical change that the Association wants—development of a quick answer service for members with a sudden technical problem. There is far more being built up for alteration than that, but the idea that members should be welcome to ring up known ERA researchers for a quick opinion on the technical essence of a problem epitomises the more personal, more active, more closely tied with industry's day-to-day needs approach that is being sought. For the ERA member, the new look, if successful, will bring more obvious value for the money he is asked to subscribe. For the Association itself, it can bring an already worth-while job broadened and made more immediate in its tie with industry and, if virtue has its reward, an increased income that can mean more and better-paid staff and experimental facilities. The uses to which these can be put are taken care of by the rest of the Association's policy. This includes continuation of the present scope of research and perhaps an extension into cost analysis and operational research.

AUSTRALIAN UNDERGROUNDING

Australian population densities are in most parts well below those experienced in the UK, so distribution practice in that Commonwealth has few direct lessons for engineers here. There are some points of relevant interest, however, in the efforts that are being made in many parts of Australia to escape from the disadvantages of overhead distribution. Australian supply engineers have seized on the opportunities offered by plastics cables to make undergrounding an economic prospect. How this approach has worked out in one part of New South Wales is told in an article later in this issue. Simple jointing and the determined use of mechanical trenching methods seem essential features of making a success of this development. Experience so far has been of relatively short duration, and not all Australian engineers are so strongly sold on plastics for undergrounding as our author; discussions of the topic in local technical societies has aroused some lively debating. But this experience and initiative so far away must have an interest for the many supply engineers engaged in experiments with different types of plastics underground cable in the UK, working perhaps to more stringent legal requirements than their Australian colleagues. It is of note, as well, that the buried plastics cable idea seems to have caught on for services to farms and other rural properties.

AREA BOARD CONTROL

In its pursuit of better load factors, the supply industry is giving increasingly widespread attention to co-operation with consumers who impose loads which can be interrupted at relatively short notice without serious harm to manufacturing processes. The best-known example of this move is in the interruptible supplies feature introduced into the current CEGB bulk supply tariff. Only the largest consumers can benefit from this, since a direct supply must be taken from a CEGB-controlled substation and load-lopping of at least 25 MW must be possible, and a consumer-area board-generating board agreement is called for. But there are installations of less magnitude which can still be the subject of a worth-while exercise in load control, on an area board rather than a national basis. The South Wales EB, with its concentration of steel works and a heavy chemical works, is particularly well-suited for the development of the necessary techniques. Recently, it has installed the equipment that is a necessary preliminary to such schemes: metering gear to aggregate at every instant the load being placed by the Board on the grid at each supply point. Through this equipment, described in the article that begins opposite, the Board's control engineer is able to instruct co-operating consumers to cut their demand in time to prevent above-target demands chargeable under the bulk supply tariff being imposed on the CEGB. If all area boards organise their control arrangements to take advantage of the interruptible load potentialities of their customers a further step might be possible. This would come through the CEGB offering direct to area boards an interruptible-load tariff, without involving consumers in the agreement. Then, on request from the CEGB (having regard to national load only), the area board could cut its load by appropriate selection from co-operating consumers without these being nominated directly to CEGB level.

Meteor

This week's quick summary of electrical news faces advertisement page 20.

Control in South Wales

NEW AREA BOARD CONTROL ROOM

CENTRALISED distribution control has a long history in South Wales, for it was in the Pontypridd area in 1910 that one of the first control rooms in the country was established to ensure supply continuity to local collieries.

Although South Wales is generally associated with coal mining, in fact the South Wales Electricity Board's largest consumers are steel works, collieries and chemical works, in that order. All these industries have a feature in common in that a failure of electricity can cause both dangerous hazards and loss of production out of all proportion to the duration of the interruption and consequently, rapid restoration of supply is of the utmost importance. This requires immediate remedial measures which can only be initiated with the minimum of delay by an engineer who, in addition to his knowledge of system conditions at the time, such as availability of alternative supplies, circuit loadings, etc., has the necessary authority to direct the operations. The control engineer is also responsible for the day-to-day operating of the system to ensure maximum availability and therefore co-ordinates all access requirements necessary for the commissioning of new plant and maintenance of existing plant. He controls the emergency and pre-arranged access to the system in accordance with the board's safety rules, and, in this connection, it is noteworthy that the number of electrical accidents is the lowest in the country.

Control Room

For some years the South Wales Electricity Board has had a control room located at the Upper Boat power station near the Treforest trading estate, controlling distribution in the two eastern areas administered by the board. ("Areas" in South Wales correspond to sub-areas in most other boards). Rapid expansion of rural load and prospects of considerable development in these areas especially of supplies to heavy industry, necessitated the construction of the new Church Village control centre which is described in this article.

Church Village now handles all the control functions previously carried out at Upper Boat power station. The sites are about two miles apart and telephone circuits originally terminating at Upper Boat are now taken to Church Village over a telephone cable laid by the Board.

The Church Village control room incorporates several unusual features, but outstanding is the provision of telemetering equipment, soon to be commissioned, which will permit minute-by-minute assessment of the total MW consumption of the South Wales Board. This equipment will also indicate rate-of-change of loading and how the load is varying with reference to a preset target set up by the control engineer as described below.

The control room and adjacent offices for the telecommunication and protection staffs are grouped in a modern brick building near Church Village. The building stands on three separate concrete rafts, a form of construction made necessary by the possibility of local subsidence resulting from future mining activities in the area. This construction permits a certain amount of relative movement between the three sections of the building. The control room itself is about 70 ft long. In conformity with modern ideas on control room design there is a pleasant outlook through double glazed windows which extend its full length, giving the control engineer a view over the neighbouring valley and the 1,000 ft Garth Mountain in the distance. An unusual point of design is that the control engineer's desk faces the window and he sits side-on to the diagram displaying the two areas controlled. This position was selected after considering the necessity of the engineer needing to face a large static diagram, and also because it affords him easier access to the diagram when he has to make alterations to it. The control room also includes the new telemetering equipment for indicating MW demand and a remote supervisory control panel for the unattended grid substation at Crumlin, some 20 miles away.

Fig. 1. Checking an alteration to the distribution diagram with the reference files in the new Church Village control room

Careful thought was given to the lighting installation and the system finally chosen uses fluorescent cornice lighting supplemented by a central illuminated ceiling. This ceiling comprises five rectangles surrounded by sound absorbent material. It is also lit by fluorescent tubes mounted above square plastic diffusing panels. The total lighting load in the control room is about 13 kW and provision is made for emergency lighting of the entire ceiling installation from a 6 kVA standby diesel generator which stands in the basement. The basement also houses air conditioning equipment and stores.

Control Diagram

The two areas controlled from Church Village are the Monmouthshire and Mid-Wales Area and the Cardiff and East Central Area. They include 13 grid bulk supply points and 3,647 route miles of h.v. lines and cables operating at voltages from 6·6 to 66 kV. The complete system is represented on a wall diagram to a scale approximating to the geographical lay-out of the system

but with north represented on the right-hand side, for convenience of lay-out. The diagram is representational and does not include metering or switching facilities. It is about 50 ft long and 10 ft high, with a central 30 ft section and two winged side sections. Matt white linoleum was selected for the background material, both for its low light-reflecting properties, with consequent reduction in eye-strain for the engineers, and also because it had proved at Upper Boat to be the most suitable material for holding the pins used to depict switching conditions.

Grid and distribution circuits are represented by coloured strips conforming to the national standard colour coding, with the exception that blue has been used instead of red for 11 kV circuits. Red is reserved for earthed or isolated equipment. Apparatus at each substation is denoted by a circular disc engraved with code letters to indicate its function. A coloured pin inserted in a disc indicates that the apparatus is energised, and automatically operated switchgear is further distinguished by pins engraved with the letter "A". Red pins show isolated equipment and the addition of a red triangle indicates that it is also earthed. The diagram thus shows the entire h.v. distribution system and the state of all h.v. substation equipment.

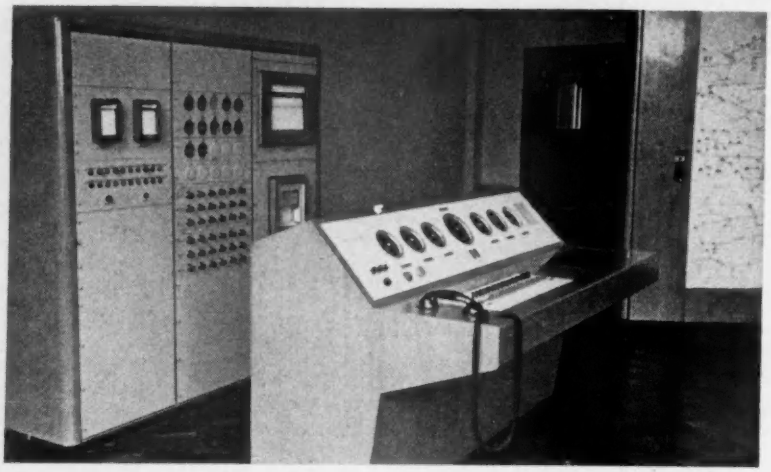


Fig. 2. Desk for continuous indication of system MW demand. Total demand is given by the centre meter with side meters for total eastern and western load, and the target and rate-of-change meters. The target is set up on the left-hand cubicle

Four separate telephone lines are brought into the control room, connected to distinctively coloured telephones. While "dressing" the diagram the control engineer can also use hand-sets which can be plugged into jacks mounted above and below the diagram. These hand-sets allow the engineer to be in constant touch with a substation during switching operations and a further jack socket at each position enables him to contact, through the telephone operator, other substations interested in a particular switching operation.

In addition to switching operations, the control engineer prepares maintenance schedules and investigates faults in conjunction with the engineering departments. The schedules are available in an index book for a week in advance. If men are working on equipment, a tag numbered to correspond with an entry in the log book, is attached to the appropriate pin on the diagram. Alterations to the diagram made during the day are checked by the night shift as an additional safeguard.

A record of all substation equipment is kept in a card reference system. These cards were designed by the Board's engineers and for quick and easy reference they are mounted in a rotatable filing cabinet. By using different coloured cards to represent transformers, switchgear, rural lines and substations, equipment can quickly be identified. An alphabetical cross-index is also maintained for rural spur lines having more than one distribution point.

Communications and Supervision

The control engineer depends on the outside staff for most of the information he requires and for the implementation of instructions which he gives for the operation of the system.

At Church Village there are six public exchange lines on the GPO system, two of these are on Pontypridd exchange and are, in fact, the same numbers that were used at the old Upper Boat control room, so that when the transfer took place, consumers were unaware of, and had not to be notified of any change when they telephoned to make enquiries about supply failures. The other four lines are on the Newton Llantwit exchange which is the exchange proper to the district. In this way the danger of the control centre being completely isolated by a major catastrophe at an exchange is lessened.

The private telephone system also terminates at Church Village and covers the greater portion of the industrial area. This system comprises about 350 route miles of open wire line, for the most part run on railway routes, but also partly on NCB pole routes and partly on board-owned routes, together with approximately 65 miles of aerial cable of up to ten pairs, over which remote control and protection equipment is also operated. In addition there is a three-channel junction carrier system operating on the Church Village—Pontymister cable. About 400 telephone sets are connected to the private system.

A v.h.f. radio telephone station is also remotely controlled from the control room and a future station, near Ebbw Vale, is under construction to give improved coverage in the

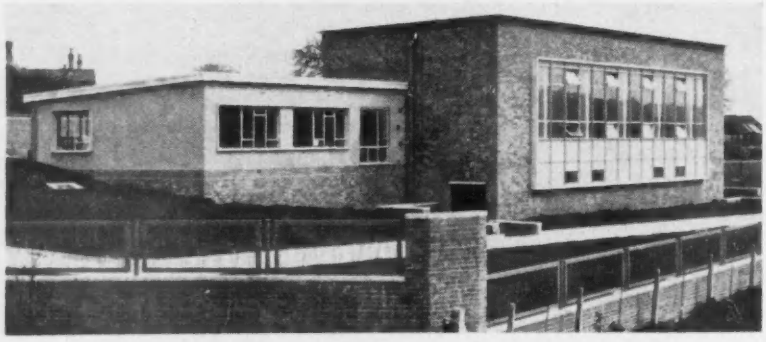


Fig. 3. Exterior of Church Village control room

northern part of the area. Forty mobile equipments are fitted in cars and vans used by the operating engineers and other operational staff.

The board receives supply from the CEGB at 27 substations, of which 13 are situated in the eastern control area and the remainder in the western control area. These 13 intake points include five power stations. There are also five remote controlled unattended substations and one of these, at Crumlin, is operated from Church Village. Crumlin has three 45 MVA transformers, 19 circuit-breakers, 22 isolators and about 120 alarms. All these are controlled and give indication on the panel, Fig. 4.

The station steps down from 132 kV to 33 kV and has duplicate busbars at both voltages. Metering facilities include voltage and current on the 132 and 33 kV busbars and a synchroscope is included which indicates synchronism conditions on all circuit-breakers.

The panel has the usual provisions against incorrect operation, e.g., breakers and switches are represented by rotatable lamps engraved with a line to represent their open or closed position. Before a switching operation can be carried out, the equipment automatically checks through all alarm circuits. Two distinct operations are required to perform a switching change. The diagram lamp is first turned to the required position. Since this differs from the true switch position, the lamp flashes. The switching operation may then be performed by pressing a separate button on the central section of the panel. The lamp continues to flash either until the switching operation is completed or until it is reset.

Maximum Demand and Load Control

Just as the consumer must pay a maximum demand charge to the area board, so in turn, the area boards pay the CEGB for their maximum demands. Consequently, it is economically worth-while for the board to investigate means of restricting their maximum demand.

The South Wales board serves a number of industrial consumers who are able to accept restrictions in supply over periods of several hours if they can be economically justified by the reduction of the number of on-peak chargeable hours which the board are then able to offer them. One particular chemical works, for example, finds it economical to restrict load from 55 to 2 MW, operating an on- and off-peak maximum demand tariff, and with the increased use of electrically heated soaking pits in steel works and similar loads it seems likely that many more consumers would appreciate a reduction of the on-peak hours, especially if their load restriction could be confined to a period of only an hour or two. The telemetering equipment now being installed at Church Village will summate the MW demand in the two areas and indicate the total demand, minute-by-minute. Similar equipment in the Swansea (Manselton) control room will sum the demand in the two western areas. The sum of these two loads, constituting the Board's total demand, will also be indicated on a total MW load meter at Church Village.

Estimating Peak Demand

Two other instruments will help the engineer to estimate how the load is changing. The first is a meter showing the rate of change of total MW load, and the second is a "target" meter showing the difference between the actual MW demand and a demand estimated by the control engineer on the basis of the previous year's figures and other factors, such as daily temperature and known load growth. The engineer will be able to preset these targets for 12, half-hourly intervals. From these meter readings it is expected that the engineer will be able to assess when the load is likely to exceed the board's maximum demand target. It should be possible for him to warn special consumers to restrict load and also to give them a fairly accurate estimated time for which the restriction will be required.

This will be a considerable advance on the present system whereby peak demand can only be estimated, at the latest, on the previous day, and since this peak load may occur during a twelve-hour period, the special consumer must restrict his load during the whole of that time.

The 27 grid substations supplying the Board are connected by either GPO or private lines to the two control

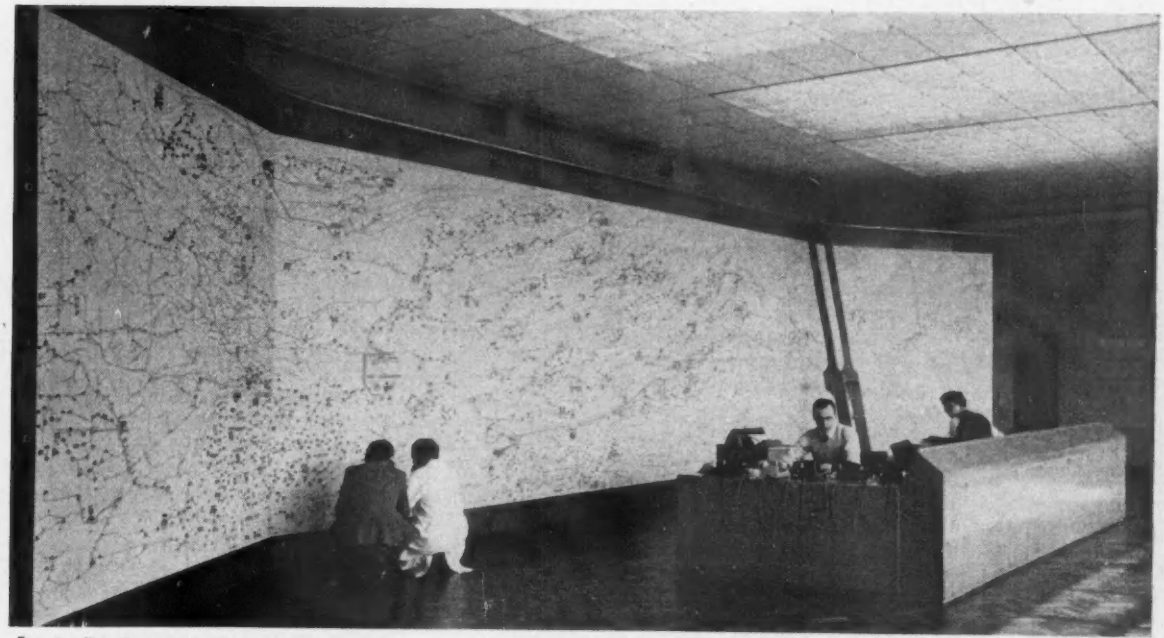


Fig. 4. The diagram showing the complete distribution system in the two eastern areas of the board. The layout is approximately geographical with north on the right-hand side. The Crumlin supervisory panel can be seen on the right

centres and for telemetering purposes, these circuits are so arranged that not more than three substations are connected to any one pair of pilots. The substation telemetering equipment includes three relays which are operated by three contacts sealed in the substation MWh meter. Operation of one of these relays is at a rate proportional to the MW loading, while the order of operation of the other two relays indicates whether power export or import is taking place. These two relays send an appropriate coding letter with the telemetering pulse train.

Transistorised v.f. telegraph senders superimpose the pulse train on to a carrier frequency of 2,220 c/s for transmission over the telemetering lines. Pulses in a train are represented by a frequency rise to 2,250 c/s whilst during intermediate spaces, the frequency falls to 2,190 c/s. Where more than one signal is sent over a pair of pilots, the mean frequencies are arranged in steps of 120 c/s. This system can be used for transmitting up to 24 signals over a sing'e v.f. channel.

The telemetering impulse rates used vary from $16\frac{2}{3}$ c/s to $88\frac{1}{2}$ c/s, enabling a substation MW reading to be transmitted in not more than 60 seconds and generally in less.

At the control room, the signal enters first a v.f. cubicle where crystal filters tuned to the carrier frequency and with a bandwidth of ± 45 c/s, discriminate between the different substation signals. This cubicle also includes amplifiers and relays to convert the signal back into a pulse train. The reconstituted pulse train operates a relay in the telemetering cubicle which charges a capacitor circuit to a voltage dependent on the rate of relay operation.

The amplified d.c. voltages representing MW loadings in the different substations are applied to series resistors and amplifiers in a summation circuit. Summation is instantaneous and the output of this circuit represents the total load in a particular area and it is this summated

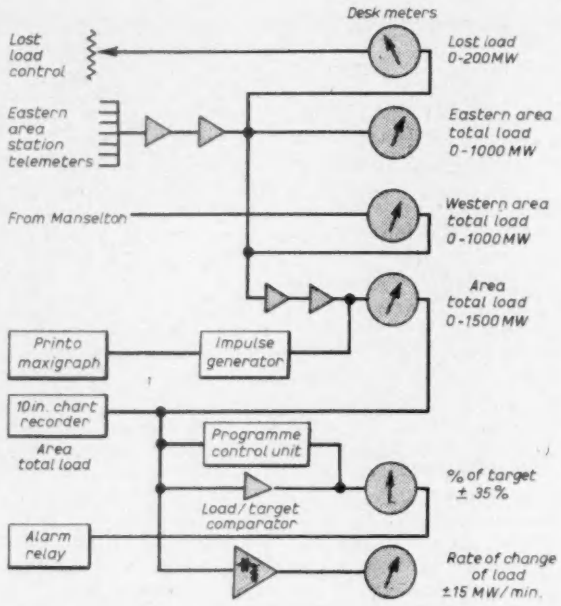


Fig 5. Schematic of the MW demand telemetering circuit

voltage which operates the area total load meter. As previously mentioned, both control centres have facilities for summating and displaying the total area MW loading, but in addition Church Village also receives the total western load direct from Manselton. These two loads are combined in additional summation equipment to give the total area board load.

Provision is made to feed into the metering circuit a signal for estimated lost load due, for example, to a substation's telemetering equipment being out of commission.

The rate-of-change of load meter is fed through a differentiating circuit and the target meter indicates difference between actual load and that estimated by the control engineer for a particular half-hour interval as set up on decade controls. These five instruments are mounted, with a temperature indicator, on the control deck shown in Fig. 2. On the telemetering panel, individual meters show load on each substation in the eastern area. The panel also includes a printometer producing a printed record of total load at half-hourly intervals, auxiliary recorders and an alarm to warn the engineer when the total load nears the target. The electronic summation equipment in the control room is instantaneous in operation so that changes in load will be apparent at most within a minute. The telemetering equipment was made by Standard Telephones and Cables, Instrumentation and Control Division.

We wish to thank Mr J. S. Lombard, chief engineer of the S. Wales EB, for permission to visit the control centre and Mr B. L. Williams, system operations engineer, and his staff, for their help in providing the material.

Fig. 6. A selection of record cards for substation equipment and rural lines. These cards are coloured for easy recognition and filed in a rotatable cabinet shown in use in Fig. 1

A nuclear ampere

CHECKING THE STABILITY OF THE UNIT OF CURRENT

by W. Gosling, B.Sc., A.R.C.S.*

DETERMINATION of the absolute ohm and ampere in terms of mechanical standards (the metre, the kilogramme and the second) is the basic means by which stability of electrical measurements is ensured. In the case of the ampere, the force between two or more coils of accurately known dimensions carrying the current to be standardised is compared, using a chemical balance, with the gravitational force on a weight. The first highly accurate determinations of the ampere were made on a current weigher of this kind by Ayrton, Mather, and Smith, in this country in 1907 (Fig. 1) and by Rosa, Dorsey, and Miller in the United States in 1911. Subsequent determinations have all followed very similar lines and have differed primarily in such details as the geometry of the coils used.

Although the errors in determination of the standard ampere are thought to be very small, perhaps a few parts in 100,000, the methods used are sufficiently similar for it to be possible that there exists some systematic error in all of them which has escaped theoretical prediction. This may not be very likely but there is no independent evidence to show that it is not the case, except indirectly through methods which assume that the ohm is also stable. It has recently become theoretically possible to design an instrument which should be capable of regulating a current to a fixed value which, even though its absolute magnitude was not known, would not alter significantly even over a very long period. This instrument is now, thanks to generous financial assistance from the Paul Instrument Fund, under construction at the Swansea Constituent College of the University of Wales. If successful, it will provide a means of checking subsequent determinations of the ampere against each other and will thus help to establish that the accepted values of the electrical units are not drifting, relative to the mechanical units, over a period.

The basis of the instrument is the measurement of the magnetic field of the current to be regulated by means of nuclear magnetic resonance. The proton (nucleus of the hydrogen atom) can be regarded, on a classical picture, as if it were a gyroscope, spinning rapidly on its axis and at the same time having a magnetic moment along the axis of spin. If placed in a magnetic field at an angle to its axis, the proton will execute a precessional motion. Due to the magnetic properties of the nucleus a pick-up coil nearby will, if suitably oriented, have an alternating e.m.f. induced in it. The frequency of alternation depends only on the steady magnetic field and the gyroscopic and magnetic properties of the nucleus. Since it can be assumed that the last two are constant, measurement of the frequency gives a highly accurate measure of the magnetic field.

Fig. 2 shows a possible arrangement for the nuclear ammeter. The current to be regulated flows in a solenoidal winding at the centre of which a sample of water is mounted. The nuclei of the hydrogen atoms in the water are excited by a coil, wound round the specimen, which

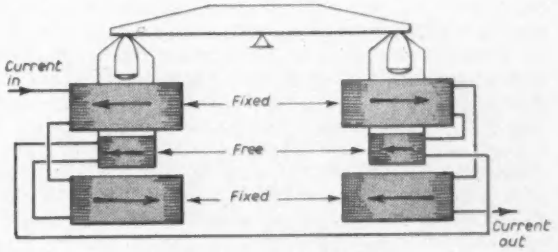


Fig. 1. Current weigher device

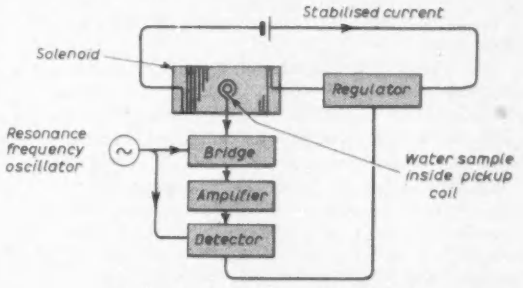


Fig. 2. Equipment for nuclear ammeter

is included in an a.c. bridge circuit and hence carries a current at a frequency which is arranged to be that at which nuclear magnetic resonance will occur. The unbalance signal from the bridge, arising from absorption of energy by the resonating protons, passes to an electronic amplifier and is used to control the current in the solenoid.

The device can thus be used to measure or regulate a current, in terms of a frequency. Frequency measurement is capable of very high precision, so that virtually the only source of error in the method arises from variations in the dimensions of the solenoid. An investigation is being carried out into the possibility of building a solenoid of quite exceptional stability by adopting unconventional construction techniques.

The experimental work is made more difficult because the apparatus is very sensitive to external magnetic fields. Even ordinary building brick and Portland cement are sufficiently magnetic to interfere with the results. Also, careful temperature control is required to avoid change in the solenoid dimensions.

Should the instrument prove successful, showing perhaps a long-term current instability of only a few parts in a million, the interesting possibility would arise that a system of electrical units might be based on accepting a defined value for the gyromagnetic ratio of the proton. The advantage of such a system would lie in the greater ease of determination of the ampere which would be possible and the fact that the method would be independent of, for example, determination of the gravitational constant, which plays an essential part in present determinations using the current weigher.

* Mr Gosling is with the Electrical Engineering Department, University College, Swansea.

Readers Views

Correspondents writing under pseudonyms are asked to submit their names and addresses in confidence to the Editor

Solderless Connections

IN reply to Mr Archer's remarks in the ELECTRICAL TIMES of 26 May, I would point out that the main aim of my discussion of contact resistance was to compare the behaviour of rough surface with that of smooth surface, particularly with regard to the breaking up of oxide films and the establishment thereby of good electric contact. In the paragraph on page 492 which Mr Archer criticises it was pointed out that with rough rods nearly theoretical values of contact resistance are obtained, whereas with smooth rods a much higher resistance is obtained. That is to say, there is a difference in that rough rods give better contact than smooth rods. I then went on to say that if the rods are left to oxidise in air for several days the differences becomes even greater, i.e., the ratio of the resistance for smooth contacts to that for rough becomes even higher, as shown by the tables in the article.

Two implications for the ordinary transmission engineer follow from this:

(a) Rough surfaces make better electric contract than smooth surfaces. Wherever surfaces are burnished to remove oxide or tarnish, the final treatment should be with moderately rough and unclogged abrasive paper and no attempt should be made to obtain a highly reflecting polished finish. With copper and its alloys the surface roughness normally present on wires is usually sufficient to ensure good contact, even without burnishing or artificial roughening. These latter treatments only need be applied to very heavily oxidised wires, e.g., where insulation has been removed by "burning."

(b) In the case of aluminium, where tough, non-conducting oxide forms rapidly and may be appreciably thick, even within a few seconds of abrading a surface, the inclusion of a jointing compound containing particles which scrape the surface at the same time as the joint is being formed is advised.

P. R. Rowland, M.SC., PH.D.,
MANAGER, RESEARCH AND DEVELOPMENT,
AIRCRAFT-MARINE PRODUCTS (GB) LTD.

High-output Phosphor

YOUR article on "Progress in Patents" for the issue dated 12 May contains a summary of one of our recently issued patents, No. 834024, and reference to an experiment in which a 60% increase in efficiency was obtained. This, in itself, was slightly out of context, but from the summary of the article in "News Sheet" a reader might interpret the reference to mean that 60% more light could be obtained from luminescent coatings in general by this new coating technique. This may cause some alarm among our competitors and undue expectations from our customers and I would hasten to correct the impression by saying that this applies only to the particular phosphor referred to, copper-activated thorium phosphate. Without this coating treatment, as stated in the specification, the efficiency of the phosphor is considerably reduced during the coating process due to discoloration.

This phosphor at present is only of technical interest and has not yet found widespread application. It did, on one occasion, almost make history at Idlewild Airport. I arrived there early one Sunday morning with a sample in my baggage and had the unusual experience of being "frisked" by a geiger counter. It surprised me and the Customs staff and it took half-an-hour to convince them that this was only a technical sample!

J. W. Strange, PH.D., A.R.C.S.,
DIRECTOR, ATLAS LIGHTING, ENFIELD.

Bathroom Techniques

I OBSERVE by *Megohm's* remarks in the 19 May, 1960, issue that attention is being given to bathroom installations. I have felt for some time that bathrooms and kitchens should be treated functionally. This means that these plans should be treated as sub-distribution points and as such should be fed by sub-mains. These mains would terminate in a switch or, preferably, an earth-leakage circuit-breaker controlling a 240/100 V centre-tapped transformer from which final sub-circuit fuses would feed separate lighting, heating and power circuits.

Although such a system would mean the provision of heavier sub-circuit wiring, it is felt that in the interests of safety it would be justified.

R. Dalziel,
BEARSDEN, DUMBARTONSHIRE.

Two-cord Ceiling Switches

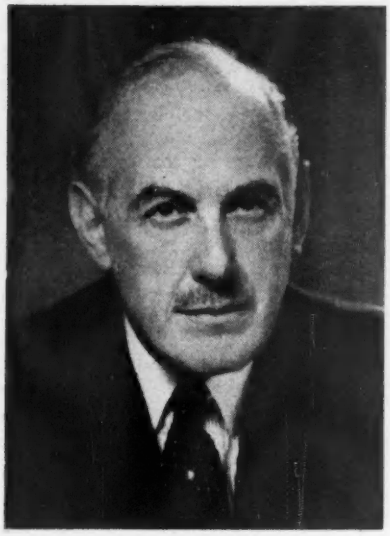
THE improvised two-cord ceiling switch mentioned by *Megohm* in some recent notes is not really novel; the GEC listed a similar switch over 20 years ago in their accessories catalogue.

The switch was a tumbler switch with brass cover but of more robust construction than the ordinary wall switch; the dolly was flat and, attached by means of a screw, was a flat wing-shaped piece of brass with a hole each end for the cords. By means of an extension, I used one of these switches some years ago as a door switch, operated by a trap-door (with folding ladder) giving into a roof space (not using cords).

I am not in love with the idea of a pull-switch operated via a conduit sunk in the bathroom wall; it suggests to me one of those old-fashioned bell-pulls with a short length of wire or chain exposed. I do think that ceiling switches could be made smaller, neater and quieter and easier to work. Even the so-called "silent" ceiling switches are large enough to control a 1 h.p. motor and need a pull of 20 lb (estimated) to operate them.

R. St. C. Ison,
CHELTENHAM, GLOS.

Bearing Corrosion in Turbines. Chemists of the Wakefield Castrol group report that they have discovered a possible cause for a puzzling corrosion of turbine white metal bearings. If a low potential is applied to a white metal/steel combination immersed in weak salt solution, then electrolytic corrosion of the tin matrix of the white metal can occur. Alternating current can cause this effect, though at a rate far slower than direct current. Formerly, it had been thought that electrolytic corrosion of steel would always take place preferably to that of tin.



THE PRESIDENT
The Rt Hon Viscount Chandos

B.E.P.C.

BOURNEMOUTH CONVENTION

Convention week at Bournemouth is fitted into four days, with the presidential address, four papers and the electrical forum session the main formal events besides the annual dinner. All the papers are summarised in the pages that follow; an account of Viscount Chandos's presidential address begins below. Discussions on the papers will be summarised at length in next week's ELECTRICAL TIMES; *and that will contain reports of other important Convention functions. Throughout, the Convention has taken as its theme: "Electricity—The New Horizon," and this key-phrase has been at the heart of the principal contributions to the Bournemouth proceedings.*

Presidential Address

VISCOUNT CHANDOS has selected as the "horizon" for his survey the 25-year period for which a doubling of the standard of living has been suggested as possible. Accepting that such a doubling can be achieved in the period up to 1985, this involves at least a doubling of the consumption of fuel or its equivalent. Some 50 million tons more of coal or its equivalent than at present may be needed for electricity supply. Facts such as these have a major significance today, in relation to the CEGB's policy on nuclear power stations.

Lord Chandos considers that the wisdom of the CEGB policy in holding to their plans to build nuclear power stations despite political pressure is manifest, and shows imaginative foresight. He suggests that the newest nuclear power stations, after allowing for amortisation of capital, would produce energy at a cost the same as for a conventional power station, if that station had to buy coal at £4/ton. A power station located at a pithead in fact buys coal at £3 5s/ton today. Thus the economic gap between coal and nuclear fission is about 15s per ton of coal at the pithead. Nuclear costs are falling and he estimates that capital cost of a new nuclear station will before long be less than £100/kW installed.

Another striking improvement in cost/kW has come in relation to large generating sets. Today, 1 kW installed in a conventional power station costs about £39 compared with £65 twelve years ago. Lord Chandos proclaims this as an example of a truly enterprising and imaginative policy by a public authority backed up by vigorous research and development by industry. However, this development has had marked repercussions on manufacturers. The man hours involved in producing say a 300 MW set plus a cross-compound 550 MW set (850 MW total) is perhaps not more than 70% of the man hours for making 14 sets of 60 MW capacity. Moreover, it has to be borne in mind that the Tennessee Valley Authority has passed beyond the 550 MW machine, having placed an order for a 650 MW unit; and that it is said to be inquiring for something bigger.

The five manufacturers of heavy generating plant in the UK have a capacity not less than 7,000 MW/year. Probable home demand for additions to public supply is about 2,750 MW/year, leaving 4,250 MW to be exported. If these manufacturers had to work at anything much below 7,000 MW/year, the industry would feel the pinch; while if it were necessary they might be able to add another 500 MW of output without embarrassment to delivery times. Large sets necessarily contain a high proportion of skill and manual labour—so the industry in the UK will be faced with a difficult problem if the general cost of these skills rises above that facing competitors in other parts of the world. Although all possible labour saving and mechanical devices have to be used, in the last resort competitive power in this field is largely governed by competitive wages.

Selling Abroad

What can be sold abroad by way of power plant depends largely on development of power in the under-developed countries. One of the greatest obstacles UK industry has in the export field is the US Export/Import Bank. Over the last year or two the tendency of the US to tie credits to American manufacturers has become a significant threat to the volume of British exports. Viscount Chandos speaks somewhat sarcastically of the 6% and 12% preference margins allowed to US manufacturers. He remarks that he is inclined to think "there is some flexibility in these arrangements."

Another difficulty in the export field relates to the financial basis of orders from under-developed countries. Viscount Chandos epitomises these in his Ruritania, which has at the moment "a largely agricultural economy, few foreign resources and a cantering inflation which some jaundiced economists describe as galloping." The cost of living in Ruritania is rising by about 1% per month. To have any chance of stabilisation, there must be some industrialisation. There is a need perhaps for 2,500 MW plant over the next few years. If these facts become known to the international electrical industry, a loan of perhaps £100 million may be raised on the initiative of that industry with the aid of various international agencies, despite some uncertainty about the ability of Ruritania to service the loan. The next stage is that contracts for the power stations are put out to international tender. The effect of the resultant competition is that Ruritania probably buys the power station at about 8-10% below the cost of the cheapest manufacturer in the outside world.

Viscount Chandos comments that this is not a striking tribute to the intelligence of British financial agencies or of the international electrical industry. Looked at clear-eyed, what is happening is that an uncredit-worthy country has borrowed £100 million, and has been able to buy the equipment it wants at under what it costs those who made available the credit.

Although this example may appear fanciful, the president says he doubts if any manufacturer would deny that it has a painful ring of the truth. If the electrical industry is not to be ruined, there must be more sensible behaviour; and in this context, more co-operation.

The question needs to be asked whether it is better for under-developed countries that the advanced countries should spend their money on research and development even if this means less immediate lending abroad. If the accent today is placed on development, then the advanced country should in the future have larger and larger surpluses with which to finance under-developed countries. There is room for discussion about this point, but it is at any rate necessary to get away from the supposition that mere lending of money to under-developed countries is axiomatically the way in which their development is best fostered.

Creating Capital

The background to these matters is that there exists a general shortage of capital at present. On the whole, the fundamental reason is that man's ingenuity as a technologist has become stimulated by the vast sums spent in modern industry on research and development, so that all over the world he has outrun his ability to turn discoveries and new processes into useful production. Viscount Chandos suggests that, despite the continuing vigilance against inflation, there is a danger that insufficient credit may be created.

It is necessary to guard against the belief that the momentum of the industrial revolution (which began in the eighteenth century, a good time ago now) is due entirely to the advances made by the engineers and scientists. The momentum was greatly increased by monetary factors, notably the discovery of gold, first in California and later in the Rand in South Africa. These discoveries themselves were prime causes of the bound forward in industry and production. It might be thought that this leads to the conclusion that the price of gold at present should be raised. Lord Chandos says that he is not necessarily advocating such a step; but he feels that there should be awareness of the obverse side of inflation, which is the danger, some time in the future, of having underestimated the amount of currency and credit necessary to keep the world's monetary system in balance.

In the second part of his address, Viscount Chandos talks at length about electricity in the home. He notes one result of this in the mounting use of fractional horse-power motors. Lighting, as well, attracts his attention and draws the criticism that lighting levels are far too low.

Confidence between Manufacturers

In conclusion, Viscount Chandos underlines that Britain is a country which has to live by its brains. It has always been in the van of industrial progress, yet some of the shortage of technical manpower arises because of misuse. Recognising that competition is a necessary ingredient of a lively economy, he yet asks whether it be sensible that four tenders should be submitted for one nuclear power station at a cost of, perhaps, £200,000 per tender? With such a practice, £600,000 is wasted every time and, what is worse still, four teams face frustration and wasted effort.

His suggestion is a conscious effort to build up amongst the leading manufacturers more mutual confidence. There must be an attempt, without undermining competition, to combine research over a wide field. Competitors should be willing to meet together to hammer out the problems of such policy. Unless they are willing to meet in that way, they have no claim to be judged to be industrial statesmen.

Despite the many problems for the electrical industry which Lord Chandos mentions in his presidential address, he finishes with a declaration of his faith in the future of the industry. He says he can think of no industry which offers greater opportunities to young men, or which will make a greater contribution to man's control over the material things of life.

Supply Conference

As is customary, a conference of electricity supply industry delegates attending the BEPC was held on the first day of the convention. The conference, presided over by Mr C. R. King, chairman of the Electricity Council, was an informal gathering providing a private forum for discussing some aspects of developments in the supply industry.

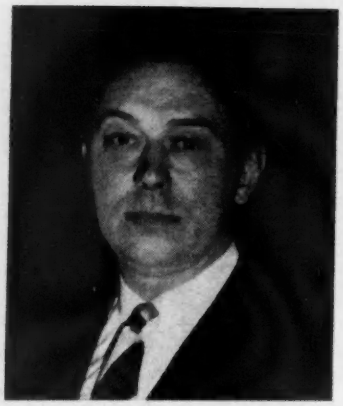
After welcoming the delegates, the chairman introduced the themes for discussion. The first, on generation, "The administrative and technical problems of running one of the Generating Board divisions," was introduced by Mr W. H. Dunkley (controller, South Eastern Division, CEGB). Two distribution problems were then dealt with independently. "The problem of reinforcement," by Mr H. W. Taylor, chief engineer, Southern EB, and "Public relations," by N. H. Bridge, Assistant Chief Commercial Officer, North Western Board. Various speakers discussed the themes and two electricity consultative council chairmen—Alderman Sir Isaac Hayward and Alderman Commander D. S. E. Thompson—also spoke.

The conference retained the characteristic informality which has marked it in previous years, and less time was devoted to set speeches and more time was made available for contributions from the floor of the conference, so that a general discussion was able to develop. There was a large attendance representing the Electricity Council, the Central Electricity Generating Board and the 12 Area Boards; representatives from the Electricity Consultative Councils, the supply industry in Scotland, the Ministry of Power, as well as representatives of various staff association committees, were present by special invitation.

1. Mr D. Bellamy and W. S. Lewis in the foreground with other delegates about to enter the hall for the supply industry private meeting. 2. G. J. Moody and C. G. Moss. 3. W. Parsons, L. G. Ludlow, F. J. Marron and F. Kenyon. 4. E. Long and H. J. Bennett. 5. S. Hartland, J. G. Kellie and W. G. Ellson. 6. E. J. Turner, C. D. Gardiner, Iuen Ellis and Sir Leslie Nicholls. 7. Lord Citrine, C. C. Hitchen and L. W. Stretton. 8. P. Sydney and R. R. B. Brown. 9. F. H. S. Brown, A. C. Thirtle and R. Baldwin. 10. N. Walsh, R. M. Broadfoot and R. D. Thompstone. 11. D. G. Brown, T. M. Ayres and C. D. Gardiner. 12. H. Lloyd-Williams and R. Thompstone. 13. V. R. O. Hutchinson and W. G. Ellson. 14. J. F. Elphick. 15. P. Briggs and A. N. Irens. 16. T. A. D. Honnor and W. J. Collins. 17. R. E. Cornish, C. E. L. Anderson and C. W. McLellan. 18. H. B. Dreyfus, B. St. M. F. Webb-Ware, F. H. Birch, S. C. Riggott, E. A. Burton and W. J. A. Painter

THE NEW HORIZON

Manufacturing



The Hon H. G. Nelson

PROBLEMS and prospects for electrical manufacturers during the next 40 years are discussed by the Hon H. G. Nelson, M.INST.C.E., M.I.MECH.E., M.I.E.E. (managing director, English Electric Co.), in his BEPC paper. The background to his remarks is set out in Table 1, though he warns that experience shows that progress in industrial production is not steady but is subject to fluctuations. In forecasting trends and planning business development it is necessary not to pay undue attention to short-time fluctuations. In the electrical field, the market for heavy plant is reasonably predictable, while that for domestic appliances is quickly influenced by unpredictable events. For example, it has been found that Government manipulation of hire purchase regulations can change the annual volume of home business in certain domestic appliances by ±50%.

Domestic Appliances

In the domestic appliance field, rapid growth of demand has moved an increasing proportion of output into the mass production class. The capital investment represented by mass production lines is so large that accurate forecasting of demand is essential. The steady decrease in the real cost of electricity (unlike other forms of fuel) helps to boost growth of demand for appliances; on the other hand, the smaller size of kitchen which has followed higher building costs is proving a limiting factor when purchase of electrical appliances is considered. Although it is possible in the newly built home to plan a kitchen of 100 sq ft to accommodate all the major electrical appliances, it is less easy to fit them into an existing kitchen of that size not specifically designed for them.

Mr Nelson suggests that house heating is deserving of more attention than it receives at present. One difficulty is that there is no up-to-date information on how the British heat their homes. He feels that the great potential market is for central heating.

Lack of adequate figures also hampers consideration of the extent to which British industry is mechanised compared to that in other countries. For example, although it is known that in 1957 American industry consumed nearly four times as much electricity per worker as did British industry, it is not possible to say how this was broken down between process and power electricity.

Table I. UK Developments, Past and Future

	1850	1900	1950	late 20th century
Population (millions) ...	22	38	50	58
Per capita income (£) ...	30	46	233	900
Fuel consumption (10^8 metric tons coal equivalent) ...	35	180	250	450
Per capita consumption (metric tons)	1·6	4·7	5·0	7·7
Electricity consumption (10^9 kWh)	—	1·0	52	339
Per capita consumption (kWh)	—	26	1,040	5,845
Installed capacity (MW) ...	—	730	13,500	82,000

Generating Plant

A considerable part of Mr Nelson's paper is concerned with equipment for electricity generation. In recent years, the outstanding characteristic has been the increase in size of generating sets. If the post-war trend were to continue, then there would be 1,000 MW single-shaft sets in operation by 1970, and 4,000 MW sets by 1980. This seems inconceivable, but it must be recognised that the 550 MW set did not seem likely when the first 60 MW sets were being designed.

Limitations which might prevent the trend in size increase from continuing are several. First there is an operational problem. The size of set is related to the size of system, and recently the set size has been increasing far more rapidly than aggregate system capacity. In regard to generator construction, it is not possible to see a way to construct a single-shaft set much larger than 600 MW because of transport weight and size limitations, and because of the limited strength of end bells. Site assembly might overcome the first of these problems, while new and exotic materials like titanium might permit an increase in machine capacity to about 800 MW.

So far as steam turbines are concerned, it is possible to foresee a tandem machine with a 36 in. blade providing at least 800 MW. Higher steam pressures than those used at present should be possible,

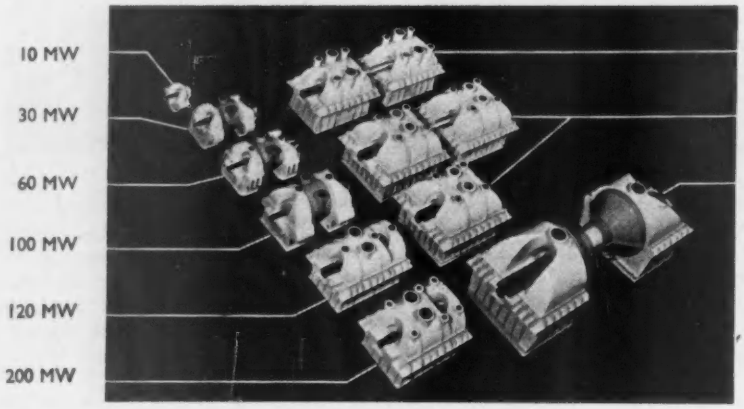


Fig. 1. Increase in size of steam turbines

1. Lord Chandos delivering the Convention opening address. 2. Messrs Ellison and Hall (of AEI) with Mr and Mrs W. A. Gallon. 3. Mr G. Oldroyd with Mr and Mrs A. McLellan. 4. Messrs W. A. Gallon and A. R. Cooper. 5. Sir Christopher Hinton and E. J. Turner. 6. Messrs H. V. Pugh and J. E. Lamb. 7. Mr W. H. Dunkley addressing the private meeting

although metallurgical limitations would make it expensive to match these with higher steam temperatures.

Overall, it seems possible to envisage cross-compound double-shaft sets of 2,000 MW coming into operation in the 1970s, assuming advances in techniques but no revolutionary discoveries. However, it is not certain that the process of falling prices per kW can continue indefinitely, for some of the expedients to overcome limitations of size are costly in themselves. It seems likely that by 1975 further increases in set size will have ceased to be economically worthwhile.

In the nuclear energy field, advances are particularly difficult to predict. One of the disturbing features of the nuclear energy business is the technical complexity and speed of development which necessitates the maintenance of large teams of engineers by the consortia. Competitive tendering and relative infrequency of orders makes it impossible to recoup spending in terms of orders, and if progress is to be maintained, Mr Nelson sees the need to devise some system which will ensure that efficiently executed projects secure some reasonable return for the contractor.

In the distribution field, the early prospect is 500 kV for transmission in the UK, although 750 kV may be necessary overseas. Conventional circuit-breakers should be able to match these voltages at high short-circuit ratings. The major problem is likely to be provision of test equipment, and here some sort of rationalisation between manufacturers and supply industry seems desirable. Vacuum switching and semiconductor techniques may provide scope for further developments within the next decade, but they need a break-through to overcome capacity limitations.

For transformers, transport again provides a limitation. Designs are nearing the limit of development, and no great improvements can be expected. 500 MVA is probably the highest rating that can be achieved within the present size limitation, although there is no fundamental reason why a 2,000 MVA, three-phase transformer should not be built.

Manufacturing

Most of these trends discussed by Mr Nelson impose on the manufacturers a heavy outlay in capital expenditure and a high ratio of overheads to direct expenditure. This will have several effects. In the first place, the industrial manager will have to devote much of his time and effort to studying and controlling his indirect expenditure; and there will be a trend for the control of direct operations to become more mechanised.

In the second place, companies will be faced with the problem of increasing size of units, with the consequence of insufficient business to support the number of companies previously operating in the field. This will dictate some hard thinking about the structure of the industry. The high costs of development will also limit the number of design teams which can be supported. Free competition in the classic sense is no longer realistic. There must be a trend towards alternative arrangements, such as collaboration between manufacturers competing on price, price negotiations between a customer and a chosen supplier, or the amalgamation of companies into large groups. Only this will make possible the reasonable assurance of continuity of employment of work people and of savings to meet the high cost of capital investment and development.

Research and development will continue to place a heavy burden on the electrical manufacturing industry.

Mr Nelson's paper discusses overseas trade in some detail, with conclusions broadly in accord with those of Mr Small's paper (page 890).

THE NEW HORIZON

Electricity Supply

Mr C. R. King

WHAT the future holds for electricity supply in Great Britain is the subject of Mr C. R. King, C.B.E., COMP.I.E.E., M.INST.F. (chairman, Electricity Council), in his contribution to the convention. One of the most important parameters will be the rate of growth of demand in terms of peak MW and kWh. In 1959, the CEBG made a careful analysis of records of the previous decade and came to the conclusion that the winter peak demand referred to standard weather conditions (average cold spell) corresponded to an average increase of 6·9% while for unit consumption the rate of growth was 7·8% p.a. For planning up to 1967-68, the suggested figures are 6·5% and 7·5%, respectively. Taken in conjunction, these two figures imply an annual improvement of load factor of ½%. The importance of accuracy in the estimates is illustrated by the consideration that had 6·9% been taken as the rate of growth of winter demand, then an additional 2,200 MW s.o. would have been required by 1970.

Table 1 shows the commissioning programme which is intended to meet the rate of growth assumed. All the large sets operate with unit boilers, though with steam conditions in the sub-critical pressure range. However, it may well be, Mr King comments, that the third and fourth sets at Drakelow C may be super-critical sets. Another feature of the programme which excites comment is that only one of the stations is oil-fired, although both Northfleet and West Thurrock were originally scheduled for oil firing.

The assumption of 90% availability of plant at the time of winter peak instead of the 88% previously assumed is equivalent to saving 650 MW in 1964.

Dealing with operational trends, Mr King comments that it is too early as yet to forecast with any dependable accuracy the correct balance between coal, oil and nuclear

1. Mr. R. D. Reynolds. 2. Miss Mary George being received by Dr and Mrs J. N. Aldington. 3. Mr and Mrs Duncan with Mr and Mrs G. A. S. Nairn. 4. Messrs I. G. Evans, D. G. Gwyn and Mrs Evans. 5. Messrs J. K. Webb, W. Moody and J. D. Nicholson. 6. Mr. S. E. Goodall and Lord Chandos. 7. Lord Chandos, Mr J. S. A. Bunting and Dr J. N. Aldington. 8. Messrs C. E. Knight, A. S. Shier and W. Brimacombe. 9. Messrs A. N. Irens and S. F. C. Whitmore. 10. Mr H. B. Bruce

generation. However, an attempt at this forecast will have to be made in the next year or so. Cost returns show that capital cost is falling in real terms, and so is the manpower involved in operating the CEBG stations. In the conventional stations to be commissioned in the next two or three years, the operational staff will number only 0·3 to 0·4 men/MW. This reduction in manpower reflects not only the use of larger units, but also the increased amount of instrumentation and control equipment. The CEBG approach is first to achieve fully remote control at West Thurrock; and, if this is successful, to employ a computer to control operation.

On nuclear power, Mr King thinks it is likely that Sizewell (550 MW) will be included in the 1965 plant programme. If Oldbury (550 MW) is approved it will come in the 1965 and 1966 programmes. If there is an eighth nuclear station approved for 1966, then the total nuclear installed capacity in England and Wales by the end of that year will be 4,623 MW s.o., including the UKAEA Calder Hall plant. All these stations will be of the Magnox (Calder Hall) type; later stations are likely to incorporate a more advanced design of nuclear reactor.

On private generation, Mr King remarks that the case for back pressure is not so clear cut as it seemed a few years ago, though the supply industry continues to be willing to co-operate.

Energy storage must occupy the attention of the supply industry. Pumped storage possibilities are limited; the estimate for England, Wales and Southern Scotland is 2,000 MW even if amenity considerations do not cut that down. The fuel cell provides a long-term prospect, with electricity being used off-peak to electrolyse water, to give the fuels for the fuel cell. Efficiencies at present are 60% to 70%. Compressed air may also offer some prospects, and the growing use of battery electric vehicles has some importance in this context.

For the future, the supply industry is looking to direct methods of generation without interposition of a steam cycle such as the MHD system, on which the CEBG has started a programme of theoretical and experimental studies. In fact, the prospects for generation in the 1980s are frankly stated by Mr King to be largely indeterminate pending the result of the large amount of research work now in hand.

Transmission and Distribution

In transmission, a notable feature is the rapidly rising cost. In 1958-59, £30·8 million was spent on main transmission. In 1965-66 the estimated expenditure is £57 million. By the end of 1963, the 275 kV supergrid will comprise 1,912 route miles. However, transmission has big savings to its credit. The link between the South of Scotland and the CEGB at 275 kV, for example, has effected an average annual saving in running costs of over £200,000, shared between the two authorities.

In the field of distribution, an early question will be how soon the area boards will need to raise their primary distribution voltage to 132 kV. The need of the area boards to double the capacity of their sub-stations every ten years suggests the possible large-scale use of buried transformers and also of packaged switchgear to reduce the physical size of 33 kV sub-stations. Capital expenditure of area boards is estimated to rise from £83 million in 1958-59 to £115 million in 1965-66. In the very far future, it may be necessary, in order to meet the demand for more compact substations with lower levels of noise and lower losses to be dissipated, to turn to electronics techniques. In this respect, a start has been made on the production of miniature transformers and circuit-breakers using semiconductor techniques.

Table 1. Future Commissioning Programme of CEGB—Set sizes in MW*

Planned Year of Commissioning First Set	Coal Fired	Oil Fired	Hydro	Nuclear
1959	**Drakelow B** 4×120 **Lt. Barford B** 2×60 **Elland** 3×60 **High Marnham** 5×200 **Northfleet** 6×120 **Aberthaw** 6×100	**Belvedere** 4×60; 2×120		
1960	**Rugeley** 5×120 **Skelton Gr. B** 4×120 **Staythorpe B** 3×120 **Uskmouth B** 3×120			
1961	**Padiham B** 2×120 **W. Thurrock** 2×200; 2×300 **Willington B** 2×200		**Rheidol** Total 49 **Ffestiniog†** 4×75	**Berkeley** 275 **Bradwell** 300
1962	**Blyth B** 2×275; 2×350 **Richborough** 3×120			**Hinkley Pt.** 500
1963	**Thorpe Marsh** 2×550			**Trawsfynydd** 500
1964	**Drakelow C** 2×350; 2×—‡			**Dungeness** 500

*Nuclear stations, sent out capacity; other, installed capacity. † Pumped storage. ‡ Size of Nos. 3 and 4 sets not yet decided; station capacity about 1,500 MW total.

Load factor improvement remains of importance, but the chances of any spectacular improvement through off-peak tariffs is slight. The loads to be sought are those restricted to winter night time and to the summer and large, continuous loads which can be shut down or reduced during the peak.

In an effort to improve load factor, area boards now offer a wide range of tariff arrangements, in contrast to the flat rates and straight two-part tariffs of early days. Mr King instances one board as having over a few years secured acceptance of off-peak tariffs by 7,500 consumers in respect of more than 100 MW of installed load for off-peak use. However, the prospects are perhaps better put into perspective by another board, which estimates that even if off-peak sales increase at a rate of 25% per year, they will still not amount to more than 1% of all sales by the mid-1960's.

Looking to the future, Mr King warns that there are several influences which have been tending to favour load development, which must be easing off. Connections of entirely new domestic premises (as distinct from rehousing) must soon fall, and the rural electrification programme is nearing its end. Electrically-operated transport continues to decline. Industry has carried its basic mechanisation a long way and change-over of industry from private to public supply is likely to be a less significant contributor to load growth in the years ahead than it has been in recent years. On the other hand, industry is likely to increase its use of electricity per worker, and there will be demands for more electricity to relieve drudgery in the home.

Finally, Mr King calls for close attention to recruitment and training of the leaders of the electrical industry in the future; and to the recruitment of more women trained in electrical engineering.

THE NEW HORIZON

Electrical Exports

THE record of the electrical industry in exports is extremely good and it is understandable that Mr E. V. Small (joint managing director, AEI) should feel cause to complain in his convention paper about "constant exhortation from all sides to export more and more," which seemed to him to lack any sense of direction and to have an undertone of inferiority complex. His aim is that the export side of the business should be treated as an equal to the home side, equally entitled to an agreed and stable policy.

Mr Small suggests that in most cases a target can be found in terms of a ratio between export and home business which can act as a central point in planning. Moreover, he thinks that such a target can justifiably be set at a percentage considerably higher than that achieved in the past, when export has had to "take its chance" with home business. On the latter basis, the electrical industry exported between 1951 and 1958 between 18·1% and 21·6% of total output. In this context, "target" must not be confused with "budget." A target is what a firm would like to achieve, while a budget is what they expect to achieve. Moreover, a target should be fixed by each individual company in the industry; generalised targets on an industry-wide basis are probably inappropriate. For all that, the impression is strong that the electrical industry cannot be satisfied with overall results amounting to the export of 20% of the national gross product for goods of this category; an overall target of 25% seems practicable.

On the vexed question of finance for export, Mr Small remarks that the operation of the World Bank and various semi-governmental agencies such as the US Export-Import Bank and the UK Colonial Development Fund, leave a wide field of credit demand which can only be satisfied by using private funds. Since the war, restrictions on flow of capital abroad have faced industry with a situation where it has had to offer and arrange finances for extended terms of payment spreading over many years, where previously the borrowing would have been carried out by the customers on the London money market. No manufacturer is able to find capital, in addition to his own financing requirements, to support operations of this nature. Since to borrow from the banks demands security beyond what the manufacturer can offer, industry is dependent on Government to take over the bulk of the liability of guaranteeing financial operation involved in overseas contracts. The result is that many firms, prepared and able to match their technical skill and manufacturing ability against all comers, find themselves bogged down in a mire of money problems quite outside their sphere. Mr Small thinks that many of them lose heart and fall out of the export race.

If the electrical industry is to meet the challenge of the 1960s, the UK must find the means of using money particularly suitable for investment periods of 15-20 years. He suggests that insurance companies provide a suitable source of such funds. In this connection, manufacturers and contractors should press for the divorce of project finance from contractors, and urge on Government and banking houses the necessity of exporting finance on sufficiently long terms to meet the requirements of worthwhile overseas capital projects. Financial operation in such cases will demand banking syndicates to spread the demand in money and equivalent industrial syndicates or groups to support the financial negotiation.

Mr E. V. Small

Group Contracting

Developing the idea of group contracting, he notes recent orders to continental banking syndicates solely on the offer of finance for stated power projects. The award of such contracts has left details of co-ordinated contracts to be negotiated at leisure within the global sums agreed. The electrical industry in the UK is only just beginning to realise the vital necessity of extending its activities in this connection.

As a definition of group contracting, Mr Small suggests: "The formation of a group of complementary manufacturers and contractors through the medium of a company or a partnership for the purpose of tendering for and securing a contract for the execution of an engineering project overseas." On this basis, he feels that consulting engineers should be able to welcome the extension of group contracting. For them it can resolve a number of problems they face when trying to arrange use of their services in overseas territories, particularly in underdeveloped areas, where ability to pay separately for consulting services can be lacking. Group contracting can offer the consultant the prospect of collaboration with an industrial group in a manner wholly compatible with his professional status. He would take part in preparation of group tenders, his further services being calculated into the tender either at the disposal of the contracting group or the purchaser as may be mutually agreed, but in either case acting during the contracts as an independent consulting engineer with all that implies.

What is required in all cases, Mr Small suggests, is initiative on the part of one firm or even one individual who may be in a position to bring together the necessary elements and weld them into a working unit.

Local Manufacture

A question of topical importance in the export field is whether a firm should engage in local manufacture. The dilemma is that of deciding whether it hurts less to help a one-time purchaser to take his business away from you and to do it himself; or to refuse to help, and see him find someone else to do so. Experience suggests that once the process of local manufacture begins, the inevitable end, be it tomorrow or 100 years' time, is that the local industry will break away and become completely independent of its parents. With this knowledge, the problem must be approached as one of straight business, with no sentimental over-tones.

THE NEW HORIZON

Domestic Electrification

Mr T. E. Daniel

HOW domestic electrification will look at the end of the 1960's is the subject of the paper by Mr T. E. Daniel, M.ENG., M.I.E.E., M.I.MECH.E. (chairman, North Western EB). His approach is to consider the principal electrical appliances one by one in the light of the progress they are making at present.

So far as electric cooking is concerned, 250,000 domestic premises are changing over to electric cookers every year. Of the factors which in the past have kept down rate of growth of the cooking load, fear of supply failures has largely disappeared; concern with cost of electric cooking compared with other fuels is now less effective, although some difficulties remain, and developments in hob facilities of electric cookers have largely removed criticism that the electric is too slow.

With this background there is hope of greater share in the total market for cookers, provided prices are kept attractive in spite of incorporation of automatic devices; and provided such additions to the traditional cooking facilities do not cause excessive maintenance costs.

Water Heating

So far as water heating is concerned, Mr Daniel predicts that progress to 100% saturation will be rapid, considering only premises where plumbing permits an immersion heater to be used. The task in the next few years may change from selling the idea of electricity for water heating to that of educating users in getting the best service from their electric water-heaters. There will also be a need to persuade consumers to use the heaters so that the load factor of electricity supply is improved. It is arguable that the industry ought to try to persuade builders of new property to install hot-water vessels of not less than 50 gallons capacity. The idea is that they should be installed with sufficient space to permit heat insulation to be added later to fit them for off-peak operation.

Demand for self-contained water-heaters may be expected to increase, though it is limited at present by the generally accepted desire not to exceed a loading of 3 kW. In anticipation of supply networks capable of accepting greater loads, it may be wise for the industry to think in terms of 5 kW water-heaters, and to consider how these may be connected. The absence of any domestic plug and socket accepting a load in excess of 3 kW could be a handicap here, and Mr Daniel raises the question whether the industry ought not to be preparing plans for the use of 25 amp plugs and sockets for domestic purposes.

Space Heating

Reluctance of the supply industry to encourage all-electric schemes involving space-heating for local authority housing estates is occasioned by capital investment problems, but it may prove short-sighted. The alternative is to accept load as it comes along, which may mean that distribution systems coming into use today may not be able to deal with the load in a few years' time, because of a large concentration of portable heating appliances. If floor-warming is encouraged on such estates, there is some control of load characteristics.

Ceiling heating should prove of interest to the supply industry in connection with existing properties. Mr Daniel feels that the need is for a light-weight heat storage medium which can be fixed below existing ceilings when the height will allow this. Experience has shown that low-temperature radiant ceiling heating is an acceptable form in domestic premises.

On the question of cost in space-heating, the initial advantage of electric heating lies in its low capital cost relative to competitive fuels.

Mr Daniel sees a hopeful prospect for refrigerators now that saturation has reached the point where sales may be expected to develop naturally. But he warns that lack of space in kitchens may hamper progress. In the field of laundry equipment, the central point of controversy is drying appliances, and he sees the tumbler dryer as the appliance of the future.

Basic Factors

Looking at the basic factors influencing trends in domestic electrification, Mr Daniel notes two important difficulties for the electricity industry. The first is that the public prefer "pay as you go" fuel bills to heavy quarterly accounts. The other, that the industry can offer no ready solution to the waste-disposal problem, such as is provided by a solid-fuel boiler. Other factors needing attention are easy terms for house wiring and greater emphasis on voltage and supply security and appliance repairs.

An increased liking is discernible amongst the public for the type of maintenance agreement where the customer pays a fixed annual or quarterly sum for inspection and adjustment of apparatus, and is charged for any part replacement or major overhaul on a fixed price or time-and-materials basis. Mr Daniel suggests further that the time may come when a comprehensive and periodic check of all appliances and wiring in a house would be welcomed by the consumer for an inclusive charge. An extension of this idea into discouragement of amateur repairs sees the boards, as a service to all parts of the electrical industry, providing a basic inspection and adjustment service at a rock-bottom small quarterly charge.

This is not a complete answer to the maintenance prob'em occasioned by the sought-after increase in number of electrical appliances in the home. If it be argued that servicing should be left to manufacturers, however, then the consumer is going to have calls from an increasing number of manufacturers' service men.

To any question whether the supply industry wants the all-electric load, Mr Daniel replies that the industry cannot altogether pick and choose; the alternative may be to have to accept the role of topping up solid fuel and oil and other central heating systems.

E.R.A. seeks improvement

LOOKING TO INDUSTRY'S NEEDS AT HOME AND ABROAD

FOR more than 39 years the British Electrical and Allied Industries Research Association has been a familiar part in the electrical scene. It is one of the largest, the earliest, and the most successful of the co-operative research associations which are a feature so peculiar to Britain. ERA undertakes for the electrical industry as a whole many tasks which could not easily be carried out by any other body. Yet electrical industries overseas function without an equivalent to the ERA. Is there a lesson to be learned from these other ways for the industry here? If there is, now is the time to apply it, for ERA is changing; changing in the relative emphasis it places on different sections of its activity. Those responsible for the fortunes of ERA believe that the alterations in hand can lead to a better service for members, a service more deserving of free-handed financial support. How far such changes should go is the question with which the present article is mainly concerned.

Research in U.S.A.

How research is managed in the USA was recently looked at by Dr H. G. Taylor, the director of ERA, during a trip to that country and to Canada. Dr Taylor found two outstanding differences between the USA and the UK in this matter of co-operation in research. In the first place, American manufacturers do not appear to have that spirit of co-operation for mutual advancement which marks the electrical industry here; though the privately-owned and substantially non-competitive supply undertakings do combine very easily for experimental purposes and interchange experience. The other factor is the absence of anything like the industry-supported research associations.

Where research is to be carried out in the US on some basis other than individual enterprise by a manufacturing or other concern, it is placed with a sponsored research institute or a university—and the universities in this respect have established sizeable departments often separated both geographically and organisationally from their teaching establishments. In both university and institute sponsored research is made to pay; the fees collected are high enough to cover overheads as well as direct cost, so that even where research institutes are endowed, that source of income is not always used. A notable success with patents may even give the research institute sufficient uncommitted income to permit it to carry out original research, entirely unsponsored, to the advantage of its staff's morale and scientific contentment.

Although manufacturers do not co-operate in general, when the situation is one that demands agreement, for instance, cable ratings for a new range of cables, then the manufacturers come together willingly enough, though such *ad hoc* groups break up when the immediate task is completed. And equally, although the supply undertakings are deeply committed to joint research projects, individual supply companies are willing to consider manufacturers' propositions to try out some new design of equipment—and the results, whether good or bad, are quickly passed on to others who may be interested.

Selling Research

Against this background of research set-up far removed from that familiar here, there stand out features that may have far-reaching significance for the future of co-operative research. Cash-dependent American sponsored research institutes do not offer their services in any passive way. They do not wait until a manufacturer or a supply group has identified and isolated a problem and has begun shopping around to find the facilities to search for a solution. The research institutes reckon themselves well enough informed to spot a line of investigation that will be worthwhile to some industrial interests before those interests have progressed so far as to think of the problem as a firm project in its own right. And they go out to sell the idea for an investigation, for which their customer will pay. And pay the customers do, as well as keeping the institutes busy with research and development projects that overflow their own large research departments.

That stands in sharp distinction from what has become the British practice. It raises the question: if it can work with extreme competition as the background, may it not have an important part to play in a more co-operative climate? Indeed, extending the line of thought, ought the ERA to become more positive in its approach to the industry it serves, pressing ideas upon it rather than waiting for committees to come forward with schemes for investigations? And should it be entirely satisfied so long as any of its members who have subscribed can doubt the worth of their payment at the end of a year?

How much long-term research work ERA can carry out depends on its income. That is at present only £0·5 million out of the total £64·5 million which the electrical industry spends on research and development every year. So it looks as though industry is not strongly attracted to the present working of ERA in the way of general research. And yet, as shown in the ERA annual report, there is a steady increase in the income for specially-sponsored researches, which for one reason or another the ERA is judged the best organisation to undertake. There may be a lesson to be learned from this, as well as from the general observation of the North American scene with which it fits in so well.

In Touch with Members

The first step in a more positive approach must be to improve contact between the staff of the Association and all its members; with the medium-sized firm as well as the giants; and with many departments of the giants as well as the one "official representative". This is already in hand, with the accent on personal contact, although with careful attention to what the printed word can offer as well—more attractive, better presented reports, quick reference sum-

maries for management, special keep-in-touch publications for the more distant and overseas members. But it is the personal contact that can count. The aim is to make ERA mean a specific face, a specific voice on the telephone.

May it be that the usual result of such personal acquaintance in engineering will develop, the quick telephone call when a tricky problem is thrown up, in the hope of some clue to an easy way out? That may indeed come. And it is ERA policy to welcome it. Confidence in the wide experience of the technical staff of the Association through their central point in industry, to know a thing or two about the scientific basis of production and operational troubles is behind this acceptance of what would be an extra task. It is another facet of the recognition that the ERA must give direct, everyday value for its members' fees if they are to be encouraged to think of those fees as a well worth-while annual investment rather than a benevolent disbursement.

But surely, some may argue, answering detailed questions arriving out of the blue will take time away from research. It will, but it will keep the research staff more closely in touch with industry, and there is a long way to go before there would be any question of some limit having to be placed on this sort of service to members. Few firms today think of ERA when they have specific troubles. If the Association's plans prove so successful that in the future a significant proportion of its members do so, then the only move will be to introduce some charge for the enquiries which involve major experimental work for their solution. The ask-if-we-can-help service is promised as a continuing essential of ERA organisation.

Research Industry Wants

Special subject research, already mentioned, comes into a similar category, in that it is paid for because it is outside the interests of the generality of members, because the effort is unbalanced in relation to the broad research programme. Can it also be attacked as detracting from the effort that can be put into the general research programme? Again, the ERA view is that this type of criticism is misdirected—always provided staff is being obtained in sufficient numbers and quality. The argument runs that there should be no limit on specially-sponsored research that pays its own way, *provided the funds available for general research are being fully deployed for current activity*. The income for the special jobs contributes to the health of the organisation generally in that it builds up the staff, contributes to the inevitable administrative and housing overheads and widens the experience within the organisation of different types of engineering problem.

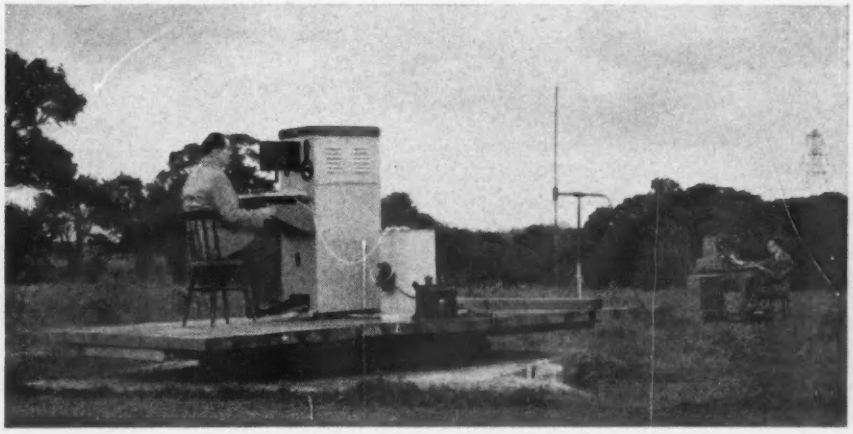
And so to the question of the other extreme, the work that industry does not realise it wants carried out; the investigation that can be seen as valuable from the research association standpoint. An important factor that cannot be burked is the unwillingness of some engineers to ask the basic question that is worrying them; indeed, their inability on some occasions to see what is the crucial question. When such circumstances arise some sort of solution is reached on a step-by-step basis. But often the right question pursued through experimental work could bring an answer securing much faster advance and a firm jumping-off point for the next important question. ERA may need to sell ideas for research to industry, just as the American research institutes do. If the investigations that result are winners, then once more the value of ERA membership is demonstrated.

There is a corollary in the need for ERA to follow up its research findings, and check that industry has appreciated their significance. It is not sufficient to provide the results and assume that all their implication will stand out clearly to anyone interested. The ERA needs to be like the negro pastor of legend—first he tells them what he's going to tell them, then he tells them, and then he tells them what he's told them!

Return for Membership

These suggestions for improving the return in worthwhile information attracted by a subscription to ERA can be judged only in the light of what a member gets at present. Assuming him to be relatively inactive in the administration of the Association, his most tangible return is earlier access to the ERA research findings than he would have as a non-member. If a research produces results which can affect the products of a manufacturer, then general publication of a report is delayed long enough to permit members to incorporate the advantages of the results into their products. Indeed, since members know in some detail what researches are in hand, they can if particularly interested keep in touch with the progress of the work. There are, of course, other privileges in price of purchase of reports, and the general access to the Association's information services.

What has been discussed in this article is the way in which the ERA can enhance that return for membership fees; from the aspect of the ERA administration, the ways in which it may attract increasing subscriptions, so that through employing more and better-paid staff, and increasing the range of its equipment, the potential of the Association can be raised. It has been assumed implicitly that the range of work should continue much as at present,



ERA research serves many aspects of electrical engineering. Here two members of the Association's staff are working in a field on interference measurements. The operator in the far distance is using standard PO interference measuring equipment, while his colleague in the foreground is operating a r.f. plastics welding equipment. The rotating table on which the welding equipment is mounted permits a polar diagram of interference levels to be obtained

with the way of handling it changing. But even this assumption is being challenged in the questing attitude of self-examination now at work in the ERA.

Attention to the Commonwealth

More attention to overseas requirements, with the ERA the centre for Commonwealth co-operative electrical research is one exciting possibility. The trip whose results occasion this article were concerned in part with increasing recruitment overseas, and they do not represent the total effort that has been made in this direction. There are already many overseas members of the ERA, and much of the existing research programme produces results of as great a value to electrical engineers abroad as in this country. If close contact can be maintained with overseas members, however, wider possibilities open out. ERA can become a clearing house for common problems of developing countries, for electrical techniques associated with particular types of climate or stages of social organisation. Overseas members can become more effective in influencing the research programme; the Association can reveal to overseas engineers that they have a common interest in certain problems, not previously recognised by the widely separated organisations involved. Again, the enhanced significance of service for members.

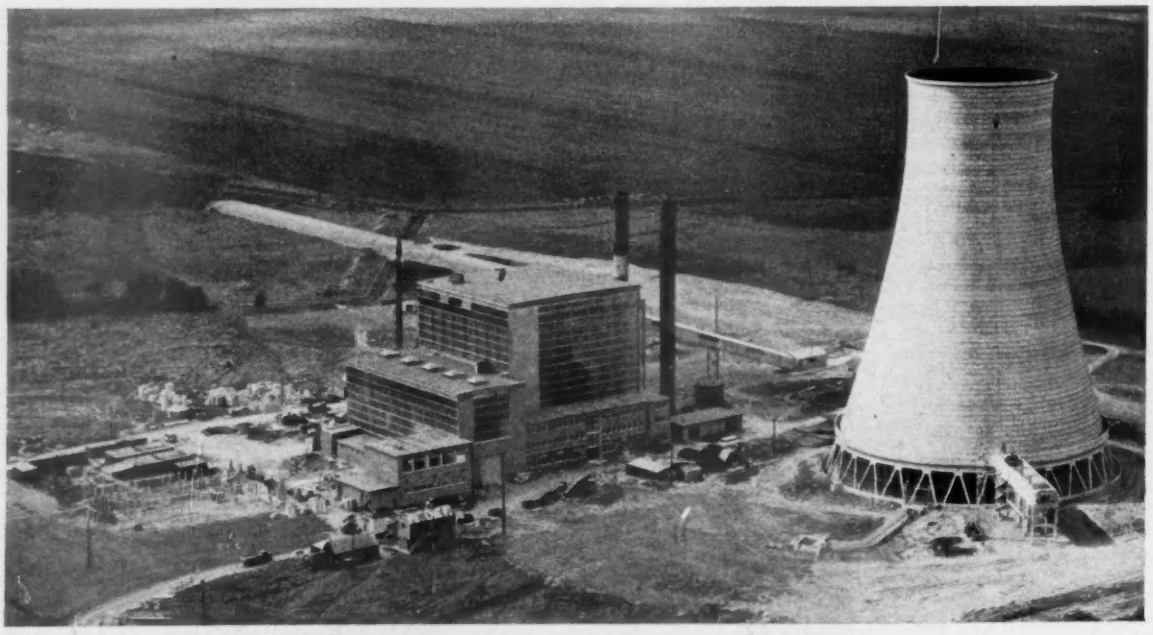
A second possibility is more directly concerned with manufacturing. It involves the Association taking an interest in matters common in production techniques. Even an investigation of relative costs in terms of money or of time for widely used processes such as coil winding or taping, would be of value through indicating to some firms that they were doing better or doing worse than the national average. Beyond that, there might well be shown fundamental principles in the successful ways of carrying out some operation, not apparent because those successful techniques had been developed by a step-by-step method. Isolation of such factors and their explicit proclamation could be important in raising the efficiency and competitiveness of the industry as a whole. Other research organisations have tackled this type of investigation with success. Again, it represents initiative from the Association; not to tell members how they should conduct their business, but to draw their attention to shortcomings that offer scope for cash-significant improvements.

Last year the ERA had a higher income than ever before, and its plans for new premises were progressing fast. It is streamlining its administrative procedures to speed up research service to members. Yet the willingness to improve service goes beyond administration alone, as the article shows. The views it expresses are developed from talks with a number of ERA officials. Our thanks are due to the director of ERA, Dr H. G. Taylor for making this investigation possible.

EIRE'S RHODE POWER STATION

MILLED peat is used to fire the 210 klb/hr boilers of the Eire Supply Board's Rhode power station, which was commissioned last month. There are two boilers (Walther et Cie), feeding two 20 MW turbo-alternators by De Laval Ljungstrom. Steam conditions at t.s.v. are 650 lb/sq in., 850°F. The net calorific value of the fuel at 55% moisture content is only 3,370 B.Th.U./lb, and its size distribution is described as "dust, up to ½ in. diameter." The station is provided with one 260 ft high, 190 ft base diameter hyperbolic r.c. cooling tower, which is rated for 1·9 million g.p.h.

It is planned that by 1963 the station will have been extended to 80 MW capacity. This is part of an expansion programme which provides that by 1969 the total output of all peat bogs which can be economically developed will be in use for electricity generation for the Eire Supply Board's system.



Rhode in County Offaly is the site of the latest milled-peat fired station of the ESB

NOTES ON WIRING

BY MEGOHM

I WAS shown an unusual 13 amp switch-socket the other day during a discussion on safety in the home. The switch-socket had two switches incorporated in it and these were so arranged that it was impossible for the plug to become "alive" until it was pushed right home into the contact tubes. This is achieved by a simple, yet effective method. One switch is used as the normal means of switching and the second switch, in series with the first switch, is actually operated by the live pin of the plug. The second switch, regardless of the dolly position of the first switch, controls the output during plug insertion and withdrawal. Both switches are fully rated and the whole arrangement is neat and extremely effective. I made several tests and found it impossible just to "slide" the plug fully home, because on the last fraction of insertion, and as the second switch operates, the plug simply jumps home. Withdrawal was as effective with no danger of accidentally touching the pins on withdrawal. A very sound job indeed and one to be recommended for house installations and where there are children.

The manufacturer who submitted the above safety switch-socket for my inspection also produced one or two other items of interest. A pattress which has an earth terminal incorporated; this is very useful as many contractors use cable with an earth conductor throughout an installation. Incidentally it is worth noting that this particular firm was, I believe, the first to produce a pattress to assist contractors to comply with Regulation 207G.

How often has the electrician, whilst installing a t.r.s. or p.v.c. sheathed installation, wished that the joint, or junction box, had more than four terminals? I know that I have done so in the past and I feel sure that many operatives will be interested in the two boxes which I saw this week. One box had six connection terminals and the other had five, all terminals being rated at 20 amp. The terminals are robust and well shrouded, and there is ample room in the box comfortably to stow the cables from the point of entry to the terminals. The firm manufacturing these employ their original arrangement for entries comprising a series of marks on the cover which is turned as required and gives various entries, and blocks up those not required. This is very ingenious and avoids breaking off the normal barriers found in ordinary junction boxes.

Busbar Trunking System

Something else new to me is an aluminium busbar trunking system which I saw installed in a small factory. I talked with the engineer-in-charge and he was full of praise for it. One feature was the lightness compared with normal types and I understand the difference is somewhere in the region of 25%. This was one of the main reasons for using it in this particular instance owing to building construction. The busbars are rated at 400 amp and are t.p. and n. The trunking is constructed from 16 s.w.g. zinc-coated steel sheet and the bars are 2 in. by ¼ in. aluminium alloy of selected electrical quality and supported at 1 ft intervals by "comb" type insulators alternatively. These form a positive support against electro-mechanical stresses under fault conditions, whilst allowing for unrestricted lateral movement due to busbar expansion. The sections are in 8 ft lengths and the tap-off boxes are fitted to the side of the trunking. This has the effect of reducing head room, another important factor in this particular installation. All necessary bends, plates and hangers, etc. are, I understand, readily available and the manufacturer is always willing to assist in the preparation of a layout for this quite useful type of system.

I recently had reason to install a single- and a double-gang 13 amp switch-socket of the surface pattern. These were of a well-known make, but I was puzzled about the entries. On the single-gang socket, provision had been made for two entries at the bottom edge, but on the double-gang unit only one entry was available. This has been a puzzle to me since, but perhaps there is quite a reasonable explanation, although I personally cannot see why there should be a difference. The wiring is just the same for both and in most cases there are two cables that rise from floor level to the socket. Perhaps someone could enlighten me on this matter? I found the matter to be rather frustrating and feel that it would greatly assist if adequate entries were provided in future.

More About Lampholders

Recent comments about the ability of certain lampholders to stand up to heat brought me a letter and a catalogue which rather knocked me for six for a few minutes. The writer pointed out that his firm manufactured *brass* lampholders which would not bind under heat and with interiors which stand up to the heat of the new small lamps now on the market. I suppose in these modern times we are apt to overlook the old brass holder which gave such yeoman service over the years. Of course, in industrial situations they are still widely used, but they have almost entirely disappeared from the domestic field where we now have "designed" and "coloured" holders made of bakelite. Personally, I think the bakelite type is ideal for houses, especially as they have been brought up to a standard which defeats the effects of heat from the lamp. The fact that they can be obtained in various colours also adds to their favour and I have seen coloured holders put to excellent use in colour schemes in shops and homes. Brass holders are not doomed, however, as they will be used in enclosed fittings and other situations for many years to come.

Safety

Safety in electrical matters is always in my mind and I have heard of further disturbing matters lately. Although the question of the colours on flexible cords of foreign apparatus has received wide publicity, there are still cases being reported of people receiving shocks from such apparatus. I spoke to one shopkeeper who told me that his staff now test *all* apparatus following the discovery that on one British made convector, the flexible cord had not even been connected to the terminals *inside* the convector. They were merely pushed through the entry and clamped in position. This, I feel sure, was an isolated case, but how very dangerous and unnerving for the shopkeeper who had the convector returned by a very angry customer.

OVERSEAS NEWS

from our correspondents abroad

CANADA

Stations Named

The four new power stations of the Hydro Electric Power Commission of Ontario in the James Bay watershed, referred to on 7 April, have now been named. The first, about 40 miles north of Kapuskasing, will be called Little Long generating station after rapids which have borne that name since early in the century. It is scheduled for completion in 1963. Townships provided the names for the other stations: Harmon generating station, at Upper Long Rapids, downstream from Little Long and scheduled to start operation in 1965; Kipling generating station, at Lower Long Rapids, still farther downriver towards James Bay and scheduled for 1966; and Pinard transformer station, which will be built near Hydro's existing Abitibi Canyon generating station on the Abitibi River as a gathering point for the 460 kV transmission southward.

Delay on Peace River

The Peace River Power Development Co. is to delay its application to the Public Utilities Commission for a certificate of public convenience and necessity until September at least, according to Mr W. C. Mainwaring, the president. He has indicated that the delay is due to the tremendous amount of work involved in preparing the company's submission. But the company must also produce financiers who will testify that they are willing to back the $600 million project. In this connection negotiations are still going on with the British Columbia Electric Co. and the BC Hydro Power Commission, but in Canada it has been suggested that the current visit to Britain of Premier Bennett of British Columbia may also have some bearing on this matter.

BERMUDA

Wiring Code

Bermuda's House of Assembly has approved the proposals of a Select Committee for the establishment of a Building Code, to which we referred on 12 May. The existing Building Authority are to draw up the code (to be based on the US National Electric Code), and an inspector is to be engaged to enforce the Code's requirements. Wiremen would also be required to be certificated, and new wiring will also require a certificate of safety before connection. In the debate in the House, some members raised doubts on the advisability of this, with the possibility of the same person giving certificates to electricians and making inspections. Several members also doubted if it would be practicable to require compulsory rewiring of buildings when defects were discovered. But eventually the Committee's recommendations were approved.

WEST INDIES

$9¼ million for Development

A total of $9¼ million has been allocated for the electricity development programme for Trinidad and Tobago for 1960. The Premier and Finance Minister has indicated that this plan includes supplies to 4,900 households in existing built-up areas, to 2,500 households in new building developments, connections to 1,600 potential consumers off existing mains, and extension to some 945 more in Tobago. He also intimated that electricity tariffs in Tobago are to be reduced to the Trinidad standard rates.

PERU

French Assistance

Two technical representatives of the French Cie. Industrielle de Travaux et Etudes arrived in Peru recently to study the plan prepared by the Ministry of Development and Public Works for the construction of small hydro-electric and thermal power stations in several provinces. The project, which will be financed by a 150 million soles credit obtained by the Peruvian President during his recent visit to France, will cover the production, transmission and distribution of energy to a total capacity of 46,425 kW.

NORWAY

Multi-purpose Plan

Noratom A/S, in a study commissioned by Oslo Municipal Light and Power Works, suggests that the central and eastern parts of the Norwegian capital could readily be heated by steam from a nuclear thermal plant. Consumer prices would be comparable to those charged for other heating methods, it is suggested. According to the Noratom report, the best solution would be to build a combination plant, fuelled by both nuclear energy and oil, which could produce electricity as well as steam. Such a plant would require a capital investment of some 90 million kroner (£4,500,000). Steam could be sold to consumers at a price of about 3 öre (1d equals approximately 8 öre) per kWh, while electricity could be delivered to the grid for 2·2 öre per kWh. The preliminary study considers a number of possible sites for the central heating plant. The Ekeberg mountain, about one mile from Oslo's centre, is recommended as the safest location.

GERMANY

Larger Underground?

The possibility of constructing a vast underground railway network in the Rhine-Ruhr area of Western Germany is to be investigated as a means of overcoming the traffic problem. The Parliament of North-Rhine Westphalia has voted in favour of the investigation, even though it has been estimated that the cost of the project would be heavy.

RHODESIA

Supply to Townships

A scheme to supply electricity to nearly 10,000 houses in African urban townships, estimated to cost around £400,000, has been prepared for approval by the Southern Rhodesia Government. The scheme provides for street lighting and house lighting in the townships, with a light in each room and two 13 A plug points per house. Cost of the wiring will be between £26 and £50 a house, including the installation of a meter or load-limiter, and the connection fee. It is hoped to start the scheme about the middle of 1961. Householders with a load-limiter will pay approximately 16s a month. For those who require more electricity a meter will be installed.

INDIA

Supply Statistics

A 13·5% increase in consumers, 17·6% increase in units sold and 11·7% rise in total installed generating capacity is recorded in the latest electricity supply statistics for India—covering the year ended 31 March, 1958. Those percentages clearly reflect the steady expansion which is proceeding. At 31 March, 1958, there were 468 authorised undertakings with their own generating plant (307 state-owned and 161 companies) while a further 287 (157 state-owned and 130 companies) received bulk supplies. Total generating capacity

at that date amounted to 3,223,111 kW, of which 1,763,257 was steam plant, 245,935 kW oil-engined, and 1,213,919 kW hydro. Their total output reached 11,369 million units. Of the 3,207,508 consumers connected, 125,414 were industrial power concerns and a further 87,649 related to irrigation only. These two accounted for more than 50% of total consumption. In a table showing each class of utilisation the percentage increases in consumption compared with the previous year are interesting. Industrial consumption, for instance, rose by 17%, public lighting by 20%, irrigation by 79%, and domestic lighting and small power by 17·2%, but traction supplies were only 4·2% up.

MALAYA

Ten-year Record

To commemorate the completion of its first ten years of public service the Central Electricity Board of Malaya have produced an interesting brochure outlining the developments during that period, and giving an indication of the future outlook. It is indeed an impressive record—four times as much electricity as its predecessor; three times the number of consumers, and plant capacity increased from 28,850 kW to 128,850 kW. Looking ahead, it is anticipated that by the time the present Cameron Highlands hydro-electric scheme is completed, probably in 1964, data will be available for the second stage development, in the Batang Padang valley which is expected to be of the order of 100 MW. In addition it is known that there are a number of smaller potential hydro sites, investigation of which has now been speeded up.

AUSTRALIA

Transformer Order for Japan

The Japanese firm, Hitachi Ltd. have recently received an order for four transformers of 330 kV, 160 MVA from the New South Wales Electricity Commission. There was keen world-wide competition for the order, and this will be the first production of such high voltage transformers by a Japanese company, it is stated. The four transformers will cost Y450 million, and the first is to be delivered within 17 months of the order, and the remainder in the following three months.

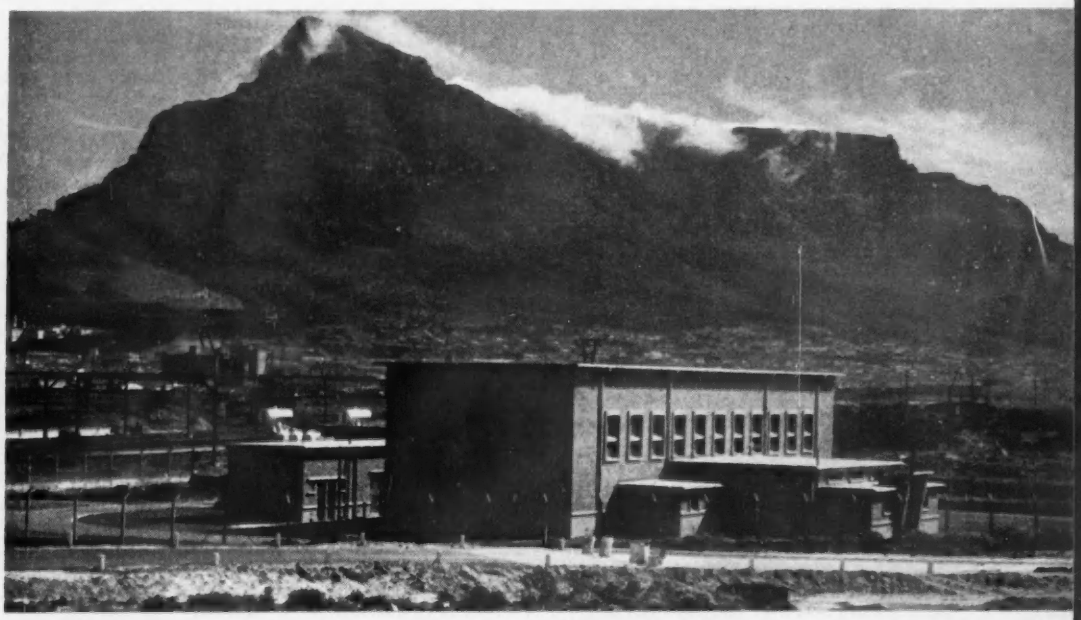
Another Kiewa Station

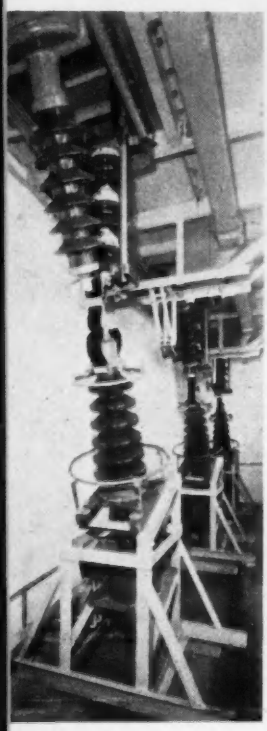
First power from the new McKay Creek power station in the Kiewa scheme was fed into the Victorian supply grid last month. Ultimately the station will have six 16 MW sets, the first two of which are operating. The third is scheduled for commissioning very shortly and the remainder should be running by early next year. When the station is completed, aggregate capacity of the Kiewa scheme will be 184 MW.

Fourth Set for Port Augusta

The Electricity Trust of South Australia have ordered a fourth 60 MW turbo alternator for Port Augusta "B" power station. The order has been placed with Stal, of Sweden, who are also supplying the No. 3 machine. This latest order will complete the major plant envisaged for Port Augusta "B," where the first machine has been under test in the past few days. Ultimate capacity of the station will be 330 MW.

66 kV INDOOR SWITCHING STATION





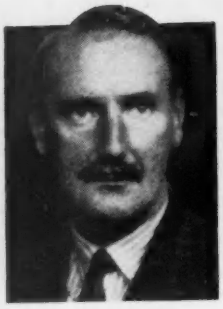
Site area limitations and atmospheric conditions necessitated placing indoors all equipment in this 66/33/11 kV switching station at Koeberg Rd, Cape Town, seen above with Table Mountain in the background. The 66 kV switchgear installation comprises a 10-panel Reyrolle s.o.v. electro-pneumatic, 2,500 MVA duplicate busbar switchboard arranged for indoor use. The switchboard has six feeder panels with Solkor and overcurrent protection, two step-down transformer panels with Duobias, balanced earth fault and overcurrent protection and one bus section panel, the complete switchboard having Reyrolle Monobias busbar protection. The switchgear is arranged on three levels, with control room, battery room, compressor room, operating corridor and cable chambers on the ground floor. On the first floor are the switch chambers and access corridor thereto. The top floor contains the duplicate busbar system with access corridors, each busbar being segregated. Equipment comprising each panel is enclosed in a brick-sided cell, with a steel checker plate floor between the switch and cable chambers, and a reinforced concrete floor between the busbar and switch chambers. Interconnection between the cable and switch chambers and the switch and busbar chambers is done by means of floor-level swinging bushing type line and busbar isolators. A general view of a cable chamber on the left shows the cable sealing end bells and swinging bushing line isolators in closed position. The transformer installation comprises two 30 MVA dual ratio 66/33/11 kV Parsons transformers with Fuller type HD on-load tap-changing equipment supplying a 10-panel Reyrolle 350 MVA 11 kV switchboard, according to Mr C. G. Downie, city electrical engineer, who provided the photographs. The equipment was originally commissioned at 33 kV and later raised to 66 kV.

Personalities *in the industry*

Dr J. H. Mitchell

Mr L. B. Pearson

Lord Verulam



Mr H. R. C. White

Mr C. J. George

For some time senior assistant commercial engineer at the Eastern Electricity Board's Chilterns sub-area headquarters at Bedford, **Mr R. F. Charles,** A.M.I.E.E., has been appointed assistant chief commercial engineer (development) at the headquarters of the South Wales Electricity Board at Cardiff. Mr Charles reached the rank of squadron-leader in the RAF during the war, and later was industrial power engineer with the Birmingham undertaking before going to Bedford in 1949 to take up a similar post with the Eastern Board. (*ESH, page 129.)

Dr J. H. Mitchell, B.SC., PH.D., F.INST.P., M.I.E.E., director of research, Ericsson Telephones, has been appointed to succeed **Mr G. D. Christie** as chairman of Associated Transistors Ltd., the concern which was formed in 1958 jointly by Automatic Telephone and Electric Co., the English Electric Co. and Ericssons. Mr Christie remains on the board of Associated Transistors. Dr Mitchell, who was chairman of the East Midland Centre of the IEE in 1954-55, started as a research engineer with BTH at Rugby and later was in the scientific research pool of the Air Ministry, Ministry of Aircraft Production, and the Ministry of Supply. He was concerned in the development of radar, VHF communications equipment and radio aids to navigation. In 1947 he joined Ericsson Telephones Ltd. as head of research and in April, 1948, became director of research.

Chairman of Stone-Platt Industries Ltd., and a director of other concerns, **Sir Kenneth Preston** has been appointed a part-time member of the South Eastern Electricity Board. (*ESH, page 83.)

London manager of Dowding and Mills Ltd., **Mr P. L. Hollings** has been appointed a director of the company. **Mr W. L. Henderson,** A.M.I.E.E., who was previously London sales manager, has been appointed southern area sales manager, and **Mr H. Glover** has joined the company from Pyrotenax Ltd. as Midland area sales manager. At the London branch, **Mr J. Buck,** formerly of Brownings Electric Co., has been appointed technical engineer, and **Mr W. E. Halls** has taken up the position of south eastern area representative covering, mainly, Kent, Sussex and S.E. London.

Formerly deputy station superintendent at Tilbury generating station, Eastern Division, CEGB, **Mr L. B. Pearson,** A.M.INST.F., has been promoted to station superintendent there in place of the late Mr R. R. Belbin, who died early last month. Mr Pearson will also act as superintendent for the Southend-on-Sea station (*ESH, page 55).

Lord Verulam, COMP.I.E.E., HON. M.I.H.V.E., F.B.I.M., J.P., is to be the next president of the Association of Supervising Electrical Engineers, and assumes office next October when **Sir Josiah Eccles,** who has held the post for two years, vacates the position. Lord Verulam is chairman of Enfield Rolling Mills Ltd., Engineering and Lighting Equipment Co. Ltd. and Sternol Ltd. Educated at Eton and Christ Church, Oxford, he was employed in Austrian and German metal concerns from 1932 to 1936 when he formed Enfield Zinc Products Ltd. at Tottenham. He was managing director of Enfield Cables Ltd. from 1943 to 1953, and was Mayor of St. Albans in 1956-57.

The South Western Electricity Board have reorganised their Cornwall districts. The former west and central Cornwall districts are merged to form the new west Cornwall district, of which **Mr H. R. C. White,** M.I.E.E., M.AMER.I.E.E., is nominated manager. The former north and south Cornwall districts become the new mid-Cornwall district, manager of which is **Mr H. T. Corrigan,** ASSOCIATE I.E.E. (*ESH, pages 101-2.) Mr White is aged 56, and before the electricity supply industry came under public ownership in 1948 was chief distribution engineer of the Cornwall Electric Power Co.; he has been associated with the electricity supply in the duchy for more than 30 years. In 1948 he became the board's sub-area engineer in Cornwall and since 1950 has been manager of the board's former west Cornwall district. Mr White was a member of the electricity supply productivity team which visited the United States in 1949 to make a special study of the electrification of rural areas. Mr Corrigan, who is aged 50, is a Devonian, and received his early technical training with Christy Brothers Ltd. In 1930, he was appointed assistant electrical engineer with Tiverton Corporation and 11 years later became their borough electrical engineer and manager. When the electricity supply industry was nationalised Mr Corrigan was appointed manager of the board's then Exe Valley district. In 1959 he was seconded for special duties under the deputy chairman of the board. The board's east Cornwall district remains unchanged. The manager is **Mr F. C. Isaac,** A.M.I.E.E., and the district office is at Liskeard.

Mr W. Lionel Fraser, who retired as chairman of Babcock and Wilcox last Thursday, has been appointed first president of the company. He had been chairman for nearly ten years. **Sir Kenneth Hague** has been elected chairman and **Sir Reginald Verdon Smith** becomes deputy chairman.

Mr C. J. George, A.M.I.E.E., has been appointed deputy commercial and development adviser to the Electricity Council, in succession to **Mr R. Y. Sanders,** who retired from his full-time appointment last October. (*ESH, page 45.) Mr George, who has assumed his new responsibilities, received his technical education at Brighton Technical College where, later, he was a part-time lecturer. He joined the electricity supply industry 25 years ago and received his early practical training with the Brighton Corporation electricity undertaking. Following war service, mainly with the Royal Corps of Signals and finally as a staff officer, he returned to the Brighton undertaking as development engineer. On nationalisation of the industry he

** Denotes revision to the "Electricity Supply Handbook, 1960."*

moved from the Brighton and Hove district to become assistant commercial engineer in the mid-Sussex sub-area of the South Eastern Electricity Board. In 1952 he joined the British Electricity Authority as senior assistant commercial engineer and later held managerial appointments with the central authority. Since the formation of the Electricity Council he has been principal assistant engineer (development) until his present appointment. During the past few years he has been associated with much of the work of EDA, has represented the supply industry on a number of outside bodies and he has been a UK representative in work on supply matters with the Organisation for European Economic Co-operation.

Mr A. M. Porkess, A.R.C.S.T., A.M.I.MECH.E., has been appointed chief engineer of the National Gas and Oil Engine Co. Ltd. Previously chief design and development engineer on medium-speed engines for Ruston and Hornsby Ltd., Mr Porkess, who is 38 years of age, served his apprenticeship with G. and J. Weir Ltd. Educated at Glasgow Academy, he is an Associate of the Royal College of Science and Technology with first class honours in mechanical engineering. From 1956 to 1958 he was hon. secretary of the East Midlands branch of the Institution of Mechanical Engineers.

Formerly field sales manager with Quickfit and Quartz Ltd., **Mr R. L. Fenwick** joined Technicon Instruments Co. Ltd. as sales manager on 1 June. Initially he will be spending two months in New York having extensive training in the research laboratories of the parent corporation with the many applications of the Technicon AutoAnalyzer and other Technicon equipment.

Mr H. G. Maxwell has joined the Belfast branch of Philips Electrical Ltd. as a junior lighting engineer. He served an electrical apprenticeship with Harland and Wolff Ltd., Belfast, and has had experience in electrical installation and maintenance work both on ships and in shore establishments.

Mr W. J. Heywood, chairman and managing director of S. H. Heywood and Co. Ltd., has taken over the direction of the Reddish Crane Works (owing to the death of his cousin, Mr S. W. Heywood) in addition to the Manchester

Mr A. M. Porkess

Mr R. C. Mercer

Mr R. Pitteway

Electrical Contracting Works. The directors have appointed **Mr W. Howe** and **Mr A. L. Hawes,** both of whom have been employed with the company for 60 years, to be general managers of the Manchester and Reddish works, respectively. Mr W. J. Heywood has been a director of the company since 1934.

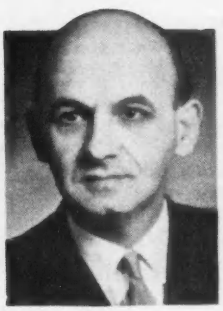
Three new appointments are announced by the south east region of Philips Electrical Ltd. **Mr R. C. Mercer** is now manager of the regional street lighting department. He joined the company as a lighting engineer in October, 1943, and was promoted area manager for Surrey, Sussex, Hampshire, Berkshire and the postal district of S.W. London in September, 1952. **Mr R. Pitteway,** who joined Philips as a lamp and lighting representative for Sussex and parts of Surrey in December, 1949, now becomes area manager in place of Mr Mercer, and **Mr D. I. Campbell,** B.SC.(ECON.), replaces Mr Langworthy, whose retirement was recently announced, as lamp and lighting representative for Bedfordshire, Cambridgeshire and Huntingdonshire. Mr Campbell, who took up his first appointment with Philips at Century Hse in August, 1956, as a commercial assistant in the tungsten lamp department, was transferred to the south east region in May, 1959, as a sales office assistant.

Formerly with Burco Ltd., **Mr G. South** has joined Ekco Heating (E. K. Cole Ltd.) as general sales representative for Yorkshire and the north east coast area.

As we briefly noted last week, **Mr A. W. P. Stephen** has been appointed general design manager of AEI-Hotpoint Ltd. as from 1 June. Mr Stephen, who was educated at Robert Gordon's College, and the University, Aberdeen, was previously marketing manager, export and refrigerators; manager, marketing services division; and market development manager. From the same date, **Mr J. B. Smith,** B.A., becomes general marketing manager. He was previously manager, portable appliance division, and marketing manager, home laundry. **Mr D. B. Hunt,** A.C.W.A., who is appointed chief accountant of AEI-Hotpoint, held a similar position with Morphy-Richards Ltd. from 1950 to 1956, and then with the British Oxygen Co. **Mr H. W. Thompson,** the new industrial sales manager, was previously manager, south eastern district, southern division sales manager, marketing manager (home laundry) and marketing manager (refrigerators). **Mr J. W. Kitson,** A.M.I.E.E., who becomes manufacturing manager, AEI-Gala Ltd., was previously divisional manager, refrigerator design. **Mr C. M. O. Jones,** now nominated marketing manager, home laundry, was previously assistant marketing manager, vacuum cleaners, and marketing manager, portable appliances. **Mr N. C. B. Abbott** takes over as marketing manager, refrigerators (he was previously assistant marketing manager in the refrigeration group), and **Mr B. Healey** becomes marketing manager, sheathed wire and special projects. Finally, **Mr J. S. Kerridge** is now marketing manager, portable appliances—he was formerly assistant marketing manager, refrigerators.

The Engineering Group of the General Electric Co. Ltd. announces the appointments of **Mr E. W. Molesworth,** as chief engineer, and **Mr J. L. Orme,** A.M.I.E.E., as deputy chief engineer, for the London, eastern and southern areas. Mr Molesworth joined the GEC in 1928 as a pupil at Erith and later transferred to Witton. He became assistant engineer at Hull branch in 1935, and a year later went to Malaya as manager of the GEC agency there. There followed periods as manager of the branches at Penang and Kuala Lumpur and then

Mr W. J. Heywood



Mr A. W. P. Stephen

Mr J. B. Smith

Mr J. L. Orme

he became chief engineer of GEC (Malaya) and in 1954 a director. He returned to England in 1956 to manage the London office of the Erith works, and in October, 1958, was appointed personal assistant to Mr A. G. Lindley, vice-chairman and managing director. Mr Orme was educated at Trent College, and after joining GEC as an apprentice in 1920 he was nominated by the company for a scholarship at Birmingham University. He returned to Witton works and later spent three years as assistant branch engineer at the company's Cardiff branch. In 1928 he moved to the head office and later was appointed chief assistant to the manager of Central Stations Department, Mr G. H. Mann, who retired on 31 Jan. last. Although in his new appointment Mr Orme will be associated with all the engineering activities of the company, his main interest will still be in the supply industry in which he is well known.

An honorary Diploma in Technology (Engineering) has been conferred on **Lord Hives,** first chairman of the National Council for Technological Awards.

At present Director of Postal Services, **Mr Alan Wolstencroft** has been appointed Director of Radio Services, GPO, in succession to **Mr W. A. Wolverson,** who is to be a deputy Director General of the Post Office.

Mr I. G. Maclaren, D.F.C., T.D., has been appointed joint managing director with **Mr T. G. Richmond,** B.SC., of Robert Maclaren and Co. Ltd. Mr Richmond continues as chairman.

After 48 years' service as secretary to Lord Nelson, chairman of the English Electric Co. Ltd., **Miss E. R. Peatfield** retired last month. Miss Peatfield has been a member of Lord Nelson's staff ever since he joined the company. To mark the occasion, Lord Nelson presented her with a silver tea-set; the gift of her many friends throughout the company.

At the annual conference of the Electrical Contractors' Association of Scotland, **Mr J. Y. Dick,** of Oliver, Melville and Co., was re-elected president for a further year. **Mr Alec Robertson** was also re-elected as vice-president for a second term.

Formerly with W. J. Furse and Co. Ltd., **Mr H. B. Knight** has joined Philips Electrical Co. as lamp and lighting representative attached to the Nottingham branch of the Midlands region.

The Minister of Power has appointed **Alderman W. J. English,** M.B.E., J.P., as a part-time member of the South Western Electricity Board. (*ESH, page 97.) Yeovil district secretary of the Transport and General Workers' Union since 1938, he earlier served with West Gloucestershire Power Co. and has been actively associated with the negotiating machinery of the Electricity Supply Industry as a full-time trade union officer for 26 years.

Mr J. J. Hill, B.SC., A.M.I.E.E., of the research staff of the NPL flew to Russia yesterday on a fortnight's lecture tour in the USSR.

NEW LITERATURE

Electricity and Magnetism

by Y. Rocard

THE classical approach to the study of electricity and magnetism, beginning with electrostatics, which has fallen out of use in technical books of recent years, is revived in this translation from the original French text of the author, a Professor at the Sorbonne, Paris. Based on a series of lectures delivered during the 1941-42 session with the addition of more recent work in the light of researches during the past decade, only rarely does it venture into the field of applied electricity and then just cursorily. It is essentially a work for the student who intends to pursue a career in pure research or in teaching. For those who are planning to enter industry in one or other technical capacity it will be found inadequate of itself. Chapters, for example, on wave guides and propagation of radio waves are only for the radio student, while transistors are dismissed in a few pages, and rectifiers are confined to a single paragraph on the now outdated copper-oxide type with no reference at all to selenium, semiconductor diodes or the mercury arc types.

The text is well presented in clear type with many excellent line diagrams and a profusion of mathematics. Published by Sir Isaac Pitman and Sons; 767 pages, 8½ in. by 5½ in. Price 70s.

Electrical Circuit Analysis

by K. Stephen, B.SC., A.M.I.E.E.

THE principles of electrical circuit analysis form part of the study essential to the attainment of a degree in electrical engineering. Once the degree has been obtained, the large majority of students promptly forget all about it until, years later, they find themselves up against some line network calculation, or similar circuit problem, to which the principles apply. When this situation arises, here is the very book for those whose memory needs jogging.

Written for the student sitting for a degree, it makes no assumptions as to previous knowledge of the subject but takes him surely from concepts of the elementary circuits to quite advanced stages from which he can progress under his own steam. Moreover, at the end of each of the 13 chapters there are exercises to be worked out. The author took his degree at Manchester and is now a lecturer in electrical engineering at the University of Canterbury, New Zealand. Published by Cleaver-Hulme Press; 254 pages, 8½ in. by 5½ in. Price 30s.

Telegraphs in Victorian London

by J. Durham

JUST over 100 years ago the electric telegraph came to London for local commercial and domestic use—the forerunner of the modern telephone system. The idea of such a London telegraph network was stimulated by the project of a firm of printers, who connected their two establishments in the City (a quarter of a mile apart) by means of a wire run over the housetops, by which novel means they avoided the high cost of laying cable. Stimulated by the success of this venture, two private companies were formed to provide local telegraph communication in London and the inner suburbs. The varying fortunes of these pioneers is succinctly, and humorously, recounted in this little book, which adds a chapter to the story of electricity's progress. Both firms were short-lived, lasting from 1859 and 1860, respectively, until 1870, when telegraph activities were "nationalised" by being transferred to the Government's postal department. Published by the Golden Head Press, 31 pages, 8½ in. by 5½ in. Price 15s.

BOOKS RECEIVED

Power Station Engineering and Economy, by B. G. A. Skrotzki and W. A. Vopat. Covers mechanical equipment in power stations with emphasis on operating principles. Text-book presentation, with many problems and extensive reference data. Published by McGraw Hill, 751 pages, 9 in. by 5¾ in. Price 97s.

Servomechanism Fundamentals, by H. Lauer *et al.* Works through basic concepts of servomechanism theory to point where typical design problems can be discussed. Mathematics kept relatively simple. Published by McGraw-Hill, 491 pages, 9 in. by 5¾ in. Second edition, price 77s 6d.

Encyclopaedia on Cathode-ray Oscilloscopes and Their Uses, by J. Rider and S. D. Uslan. Extensive treatise on application of c.r.o's to a wide variety of tasks and on circuitry and operation of c.r.o's. Published by Chapman and Hall, 1,295 pages, 11 in. by 5½ in. Second edition, price 210s.

Principles of Servomechanisms, by A. Tyers and R. B. Miles. Study with accent on equipment used and with mathematics restricted to elementary trigonometry. Published by Sir Isaac Pitman, 176 pages, 8½ in. by 5½ in. Price 25s.

A First Course in Wireless. Elementary introduction to radio receivers, revised to take account of transistors and crystal diodes. Published by Sir Isaac Pitman, 247 pages, 7½ in. by 4½ in. Fourth edition, price 12s 6d.

P.V.C. power cables for N.S.W. rural undergrounding

by H. GROSCH*

ABOUT one-third of the Corowa town l.t. overhead line system has been converted to underground plastics-insulated cable, the type of cable used being p.v.c. underground feeder cable manufactured by three principal cable manufacturers, Messrs API Cables, Olympic Cables and CMA. The work is still continuing and the local electricity authority looks forward to the time when the entire l.t. overhead system will disappear underground. There is no intention to underground 22 kV lines; or the l.t. lines carried on h.t. poles, as so far there is no economic substitute for overhead line techniques in these applications as far as country town and rural areas are concerned.

Corowa district, in common with most NSW rural areas, is well suited to plastics underground distribution as little or no rock exists at or near the surface to interfere with trenching or to present serious risk to the plastics insulation. However, due to Australia's protracted hot, dry summers and frequent drought conditions, there is some difficulty with trenching, particularly in rural areas where the l.t. runs are fairly lengthy compared with town work. The Barbour Green 702 trenching machine used in Corowa copes fairly well, but frequent breakages are experienced and much wear and tear on digging chains.

Undergrounding Methods

Methods of underground distribution are simple, and care is taken not to exceed certain limits of practice, these limits being mainly concerned with lengths of cable run, service positions and disconnects, crossing of other services (e.g., water, telephone). Some of the methods may appear crude when compared with conventional underground practice, but the local engineer is virtually pioneering a new method of distribution and has no established systems for reference. With a total lack of suitable surface connecting equipment, local initiative has become the main ingredient of our undergrounding project.

One point is now clear. After six years of underground plastics (p.v.c.) experience, the author is convinced that the use of p.v.c. insulated cables buried direct in the soil is the sound proposition for l.t. reticulation. Being satisfied on this, the local attitude has progressed from one of nervous toleration of a few services to acceptance of underground plastics on a wholesale scale. Plastics underground is now the local rule, overhead distribution being regarded as *passé*.

The presentation of plastics for underground distribution is intended to apply to country town and rural systems. For application in suburban and other congested areas it is suggested that other methods of installation would be necessary, e.g., ducting along footways, above-ground pillars and cabinets, surface openings, and so on. In Corowa, the straightforward proposition is to lay the cables in trenches, tee off services and backfill the lot, protecting the cables against damage only where other services are crossed, or where some other possibility of disturbance is evident. Rural extensions are likewise free of complications, the cables simply being run by the shortest route, buried away about 2 ft deep and connected at the ends. Protective redgum boards are placed over the cables where fences are crossed, and that is all. This practice is the same regardless of the type of country traversed, i.e., cultivation or grass, dry or swampy. At the supply end the circuit is controlled by a Deion circuit-breaker of appropriate rating, usually about 45 amps. The cables on these rural extensions usually consist of one 19/·044 insulated and one bare 7/·080, these being the phase and neutral of the 240 V supply. Occasionally there is a three-phase run to connect an irrigation pump, say, and in these cases aluminium cables have been used, p.v.c. insulated, with a bare copper neutral.

Risk of Damage

A frequent question is what will happen when a cable is dug up or ploughed by a farmer? In answer to this query we say that no farmer will plough 2 ft deep and if it so happens that the cable is damaged or cut by surface operators, the circuit-breaker protection will reasonably ensure disconnection of the faulty circuit, particularly as the neutral conductor is bare. Repair of a damaged cable is a simple matter once the fault position is located. In any case, it is considered that the underground rural extension is no more dangerous than the overhead counterpart.

So far we have had one case of damage to a rural underground cable, that being due to a road grader operating at deep levels. In this case the fault was located after the consumer reported a power failure; it was necessary to renew about ten yards of cable and resink the section to fresh levels.

Rural people are gradually becoming underground-minded with regard to their own installations, e.g., circuits to woolsheds, pumps or workshops, such extensions sometimes being of considerable length. Most of these extensions are determined on the basis of cost—poles versus trenching. Trenching costs are usually estimated on a basis of 1s 6d per yard for the Barbour Green plus labour and transport. Labour (at cost) about 10s/hour, transport 1s/mile. An average journey would be in the order of 25 miles from base, so that a 150 yd trench would cost about £22. Two poles could cost more or less than this amount, depending on the circumstances of the layout, but the advantage rests with the underground method. Drought and tough going may swing the argument in favour of poles.

Reflecting on the application of underground plastics in other countries, the author feels that English and Continental conditions would offer greater advantages than Australian, that is for rural work, rainfall being greater and evaporation of moisture from the soil much less than

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in Australia. Hence, the trenching problem would not offer the difficulties experienced there with hard-baked subsoil. England would have more natural obstacles such as rock, buildings, made-up roads, concrete works, and so on, but distances would be much less. Soil moisture would not harm the p.v.c. so there is no difficulty on this score. Using Australian methods, rural extensions in underground p.v.c. should be quite a proposition in England. In built-up areas things may be different and the author does not feel competent to offer opinions. He imagines that the emptiest of British built-up sections would be crowded by his standards (Corowa Shire, 900 sq miles, population 8,000), so what goes for Corowa town would probably not suit even a small village in England. Assuming that the consumer density/underground cost ratio levels off at about the same figure, the adoption of underground plastics distribution for high density population areas seems quite feasible. Certainly the layout and methods would be more elaborate, but the financial resources of such areas should be capable of meeting the higher costs.

Cable Routes

One of the difficulties in New South Wales is that little co-ordination exists between the General Fund Councils and the other public services such as electricity supply. A code was laid down some years ago allocating footpath sections for the various services, but that does not stop the General Fund Councils covering the whole footpath area with continuous concrete work, thereby defeating underground cabling projects before they are started. Luckily, in the Corowa area footpaths are either non-existent, except in dimensions, or else the concrete work just allows the supply authority to establish their route satisfactorily. Judging by the footpath construction in some other towns, underground cabling would present major problems. Probably the same position would exist in the older countries. If councils would construct footpaths to allow removal strips along service routes according to a prescribed code, underground cabling in built-up areas would become much more feasible.

Circuit Protection

Apart from the methods of installing the cables, protection against physical damage and jointing, the main technical argument centres around circuit protection, which again resolves into opinions for and against circuit-breakers, or rather fuses versus circuit-breakers, and from all these discussions the author deduces that the argument in favour of fuses is simply cost. Take the rural extension first :

The miniature circuit-breaker (Westinghouse Deion) is quite capable of handling the short-circuit current of a 10 kVA rural transformer, single phase, the reactance being in the order of 4%. A 45 amp breaker will deliver the full transformer rating and also afford cable protection well within the heating limits of, say, 7/·064 copper. These breakers are reasonably priced and do not affect rural costs adversely. Why use a fuse which, in comparison, offers a very poor alternative? The circuit-breaker is operable by the consumer, offers reasonable protection against sustained line-to-earth faults; the fuse has neither of these attributes. Why anyone would choose a fuse against a circuit-breaker for rural work is beyond the author's comprehension.

On town work, cost is a serious factor against circuit-breakers, a compromise has been reached using G-frame units and taking a calculated risk on short circuit at the large transformer sections. This risk is minimised, the author considers, by ensuring that the h.t. fuses at the transformer are kept to the minimum rating commensurate with full-load operation. Again, these breakers ensure protection within the heating limits of the cables, say 19/·064 copper, the maximum rating being 200 amperes. It must be borne in mind that Corowa practice is to maintain the same section of conductor throughout, or, at worst, a reduction of one gauge only; this ensures the same operating characteristics through the section as regards overload heating.

There does exist a discrepancy on rural lines where the underground circuit may terminate in a fuse box from whence lesser gauge wires proceed to circuit loadings, say 7/·064 mains to 7/·036 circuit wires protected by 20 ampere fuses. A short circuit on the circuit wires may be cleared by the fuse but is more likely to operate the circuit-breaker; but these examples strengthen the case for circuit-breakers. The same class of risk exists on town runs with circuit-breakers when a short-circuit on a domestic appliance may operate a breaker, the minor short-circuit imposed on the throughput kVA being too much for the touchy breaker. In these cases, which occur every now and again, failure by the serviceman correctly to interpret the symptoms can cause unnecessary delays in power restoration—particularly as there is still a lurking tendency on the part of staff members to anticipate underground failures and, incidentally, to appear somewhat chagrined when the underground failure proves a false alarm. Ambient temperature during a heatwave can also be troublesome to circuit-breakers; practice is to contain these in a 12 in. by 14 in. galvanised iron box mounted on the take-off pole (with the meter), and a sun temperature of about 150° or more does not help matters. On the town circuits, also, these breakers are fairly closely confined and we have similar troubles during hot spells. A lot of small Deions are used (E Frame, 45 to 55 ampere) on town runs where the take-off point is at some distance from the transformer, and have had maximum success so far.

Corowa Programme

The foregoing remarks apply to development within the shire of Corowa. This undergrounding programme was commenced in 1954 when the electricity undertaking was under the control of the Corowa Shire Council and was well established when control passed to the Murray River County Council in May, 1958. The programme has continued up to the present time, local policy being to convert the older portions of the overhead distribution to underground as circumstances permit; new extensions of low tension, town or rural, are constructed in underground.

As far as the author is aware, the Corowa system is unique in being the only section of electricity distribution being actually converted from overhead to underground p.v.c. as a programme. Some councils have installed small sections of new work and two councils, Gundagai and Parkes, NSW, have converted a part of their business sections more recently, and a growing interest in similar work is evident in other directions. Also, Corowa is first in the rural underground field.

With experience of underground plastics in the background, every confidence is felt that a practical technical and financial alternative to overhead-line low-tension distribution is now available to all supply engineers who administer town and rural electricity undertakings and, for this, due thanks to the plastics industry.

(All costs quoted in this article are in terms of Australian currency, £A1=16s sterling.)

E.T.U. eye that £27m. surplus

MR. FOULKES ON WAGE CLAIM IN SUPPLY INDUSTRY

THE electricity supply industry was successful in attaining a record surplus of £27,335,206, and made interest payments of £60,122,329 to those who did not work in the industry during the year 1958-59; but a labourer in that industry received a net amount in wages of only £7 16s 1d per week, Mr Frank Foulkes, president, told delegates at the annual policy conference of the Electrical Trades' Union at Hastings on Monday. Such a labourer had the privilege of working for a nationalised industry, he went on; if he did not work, but had done his duty to the State by producing three children, he could have obtained £8 3s per week in National Assistance benefit.

The first charge on any industry should be the living standards of those employed in the industry. In his opinion, the workers in nationalised industries in particular had a right to expect that those industries should be allowed to set an example in this direction.

Recent negotiations within nationalised industries had, once again, proved that they were completely dominated by the policies enunciated by the Government to keep wages down to bare subsistence level, and the fear of the boards that they might cause embarrassment to the Government and private employers if they granted wage increases, he maintained. Irrespective of profit or loss, the community was entitled to guarantee adequate and decent living standards to those employed in the nationalised industries.

E.T.U.'s Record

During the past 12 months, although the results of national negotiations involving major claims to increase the living standards of the workers had been disappointing, the ETU's record of achievements in negotiations undertaken with the minimum hardship to its members had resulted in some individual gains of considerable magnitude for groups of workers in particular establishments and industries. If the same determination had been displayed in regard to national claims, the 40-hour week and increases in wages, which had been requested and turned down, would have been accomplished facts, he said.

A move to give workers in the electricity supply industry the right to take official strike action was dropped later at the conference at the request of Mr Foulkes. He said that on their claim for a substantial wage increase for members in the supply industry the union were going to arbitration under clause 20 of the constitution of the N.J.I.C., and the removal of the limitations of the clause—it prohibits the unions from calling an official strike in the supply industry—would not be in the best interests of the ETU.

The union would abide by the arbitrator's decision. He was trying to get an arbitrator who, he thought, would give a decision in the union's interests and he thought the employers were trying to do a similar thing on their own behalf.

Wage Claim

The removal of clause 20 was sought in an amendment to a resolution on wages but the amendment was withdrawn at the request of Mr Foulkes who did not want the conference to be divided on the issue in view of the pending arbitration.

The resolution, which declared that there was every justification for greatly improved wage rates in the supply industry, was then carried unanimously. It called for action to improve wages and pledged the active support of all supply members.

Moving the amendment, Mr T. Wolfenden (L.S.E. No. 7), one of the leaders of the unofficial strike at power stations last December, said that supply workers wanted the right to strike.

Mr D. Chalkley (Tooting), supporting, said that a lot had been heard about werewolves. He sometimes wondered whether the negotiators for the electricity supply members were not lambs dressed in wolves' clothing because they had no power to take the only action which in the long run was feared—strike action.

What was wanted from the leaders of the supply unions was a raging campaign amongst the membership. Whatever arbitrators might say, the supply workers were determined to have a wage increase.

Mr G. W. Cooper (Blackpool) contended that supply workers were disgusted with the present level of wages. In his opinion the lights would go out tomorrow if they were given a lead.

Moving the resolution, Mr A. J. Aitkenhead (L.S.E. No. 1) protested against the delaying tactics of the management in the nationalised electricity supply industry in preventing agreement being reached on the wage claim. He suggested they should pursue a policy of non-co-operation with the management and work-to-rule.

Earlier Mr Foulkes, replying after a delegate had raised, on the annual report, the latest position on the wages issue, said there had been what was termed an unofficial body which was composed of shop stewards.

The ETU leaders had not condemned that body nor had they gone out of their way to encourage it. The body had decided that the "season" was not right for what they had in mind and the leadership was placed in a very difficult position.

"If you are going to start these movements for goodness' sake finish them or don't start them at all, because an unsuccessful movement by the rank and file can do untold harm in negotiations." Now they were going to arbitration, which he did not like.

The 367 delegates defeated a motion expressing the opinion that electricity should be cheaper to all electricity board workmen. Mr. Foulkes said they did not believe that anyone working in an industry should have something cheap conferred on them by their industry. They wanted sufficient wages for those working in the industry to buy the product of that industry.

Conference carried a resolution pressing for the introduction of the 40-hour week now in the supply industry without loss of pay. If the employers turned down the claim, the union should conduct a campaign throughout industry for industrial action to secure the demand, the resolution added.

A number of other decisions affecting the supply industry were taken and some were given almost "rubber stamp" approval. Delegates want the period of entitlement for three weeks holiday to be amended to a qualifying period of one year's service, and also the skilled rate for linesmen. They are also to press once again for an increase of time on sick pay from 13 to 26 weeks full pay.

Grave concern over the "ever increasing" practice of engaging private contractors to carry out work which is the sole prerogative of supply members was expressed in another motion. This should be raised at district level by the manual workers on works committees, the resolution stated. It had been found that it was better to leave the matter in the hands of the districts and for them to argue with the area chairman or the divisional controller against sending out work to private contract, Mr Foulkes stated. There were various difficulties. The ETU had members employed by the contractors and it was very difficult to argue that they should not be employed.

for the electrical trade

Norse light fittings

SCANDINAVIAN domestic lighting fittings, the high quality of which has been associated for so long with prices beyond the reach of the average pocket, will soon be more accessible. A new range available from Norway is the result of collaboration between the manufacturers, Kare Nilsen, and the makers of plastics weave fabrics, Teko, who have created the lampshade covers. These elegant fittings, in wall, ceiling and floor standard units, will retail at competitive prices.—*Norwegian Export Centre, 20 Pall Mall, S.W.1.*

Coal-effect fire

A TWO-BAR imitation coal fire, "Miracoal," is the first of a new range of electrical products to be marketed by Willet and Robinson Ltd. Its two 1 kW elements have the usual independent switches, and a 60 W orange lamp provides the fire light. The iron bars enclosing the "coal" have a black matt finish, and the exterior may be either hammered gold or silver. Dimensions, 22½ in. high by 17 in. wide and 10 in. deep at the base. Marketing will be through wholesalers and usual retail discounts apply. Price £10 19s 11d including tax.—*Willet and Robinson, Green Arrow Works, Maidstone.*

US style air conditioning

CHRYSLER AIRTEMP, the American specialists in air conditioning, have begun production in this country, and among their first contributions to our commercial appliance market are ranges of air conditioning units. One range, "Power King," suitable for offices, restaurants or shops, cools, dehumidifies and circulates air, exuding smoke and odours from the room through the wall by powerful blowers. Constructed of zinc-bonded steel, the cases are cleanly styled and finished in quiet shades to fit any prevailing décor. This range is one of a large selection designed for building into walls, window embrasures or simple window-ledge installation. They feature "directional cooling," which means that air can be sent in any desired direction, or all directions at once according to the position of louvre shutters in their front faces.

The range comprises six models, with ratings from 1,600 W to 2,450 W, and all but one have two-speed fans and the exhaust blower. They are all the same size; 26½ in. wide by 16 in. deep and 31¼ in. high. Similar ranges of different dimensions are also available. Prices are described as competitive. Appointed distributors.—*J. Raven Ltd., 43 London Rd, Twickenham. Probenair Ltd., 162 Great North Rd, Middx.*

Prestcold reduction

A REDUCTION in the price of "New Big Four" D.432 refrigerator has been announced by Prestcold. The new price, effective from 24 May last, is £66 3s.

TRADE PUBLICATIONS

CONTINUITY.—Six technical leaflets describing six typical products in hot brass pressings, light alloy and aluminium bronze forgings. Brass and Alloy Pressings (Deritend) Ltd., Liverpool St, Birmingham 9.

MEGGER.—Pamphlet (Publication 327) on insulation and continuity testers, Series 3, Mark III. Evershed and Vignoles Ltd., Chiswick, W.4.

KENT.—Publication No. 988, pamphlet on Commander flow-measuring instruments, and No. 15 on instrument panels. George Kent Ltd., Luton, Beds.

AMPLIVOX.—Technical leaflet describing miniature earphones for hearing aids, etc. Amplivox Ltd., Beresford Ave, Wembley, Middx.

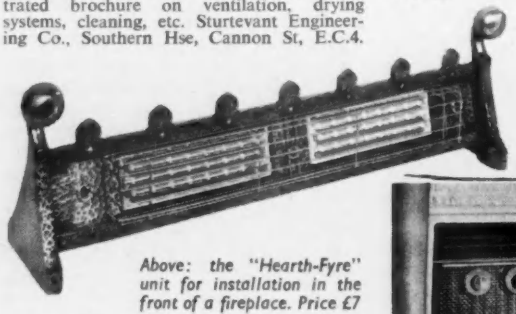
M-R.—Spring/summer catalogue and price list of appliances. Morphy-Richards, 50 Conduit St, London W.1.

AERIALITE.—12-page technical brochure on Multipoint and Television Relay systems. Aerialite Ltd., Castle Wks, Stalybridge, Cheshire.

SALINITY.—Technical leaflet on indication and control equipment. Electronic Switchgear (London), Works Rd, Letchworth, Herts.

SILVER STAR.—10-page booklet on silvered mica capacitors. Johnson Matthey and Co., Hatton Gdn, E.C.1.

STURTEVANT PRODUCTS.—58-page illustrated brochure on ventilation, drying systems, cleaning, etc. Sturtevant Engineering Co., Southern Hse, Cannon St, E.C.4.



Above: the "Hearth-Fyre" unit for installation in the front of a fireplace. Price £7

Lamp price drop

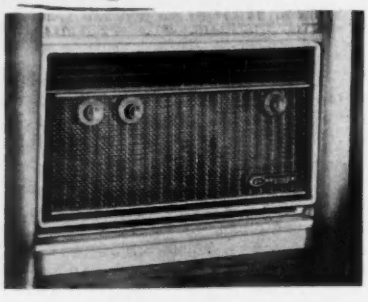
LUXRAM ELECTRIC have cut the prices of their 2,000-hr "Double Life" lamps by amounts ranging from 7d to 10½d. New prices, including tax, are as follows: 40/60 W, 1s 10d; 75/100 W, 2s 1½d; 150 W, 4s; 200 W, 5s 2d. *Luxram Electric, 72 Gt. Eastern St, E.C.2.*

Versatile food mixer

AN adaptable variation on the domestic food mixer is the Rotel "Super" Culinator. The basic component is simply a small power unit housed in a case bearing a control switch on one side and a connecting head at the top. Various accessories fit on to this head, their base connections determining the speeds of operation. The four least expensive attachments are a blender, a vegetable grater, a juice extractor, and a coffee mill which will also grind nuts or sugar. An extra gearing head drives a further range of attachments by providing connection for double horizontal spindles. With this device a mixer arm with twin paddle sockets can be added, providing a multi-speed, planetary action cake mixer. A meat mincer is also available for use with the gearing head. This power unit costs £14 5s 6d basic, the attachments from £2 4s 6d to £7 8s 4d. The extra head is £8 5s 8d. These prices include tax. *Special Electrical Appliances, 108 Leith Walk, Edinburgh.*

Electric hearth

AN unusual approach to electric fire heating is shown by the "Hearth-Fyre," a long, low unit which fits across the fire-place. It consists of two 1 kW block type elements mounted side by side on a cast iron fender-shaped body. Finished in lustre pewter or copper vitreous enamel, its decoration is unobtrusive and should merge well with any decoration scheme. The guard is chromium plated. Dimensions, 2 ft 2 in. long and 6 in. high. Model No. 4800. Price, including tax, £7.—*James Smellie, Ltd., Ivanhoe Wks, Oxford St, Dudley, Worcs.*



Below: Chrysler Airtemp's "Power King" air conditioner, built into a wall

equipment for industry

Continuous level indication

THE "Levolog" level indicator, now in production after nine months' successful field trials, is claimed to have exceptionally good long-term stability and reliability and to be virtually unaffected by normal temperature and mains variations. The indicator is capacitance operated and involves electronic circuitry, but care has been taken to keep this as simple as possible. It is said that the "Levolog" is suitable for continuous level measurement of practically any material. *Thomas Industrial Automation Ltd., Station Bldgs, Altrincham, Cheshire.*

Sub-miniature plugs and sockets

PARTICULARLY suitable for transistor applications is a sub-miniature three-pin plug and socket requiring only a 0·27 in. diameter panel cut-out. The plug has a locating flange, is available with colour identifying discs, and is claimed to withstand a d.c. voltage of up to 1·5 kV without breakdown. Two other introductions are a miniature hermetically sealed plug suitable for up to 5 A, with up to 50 ways and an aircraft plug connector with up to 15 ways rated at 13 A. Both these items have gold-plating on silver contacts and the hermetically sealed version is intended for soldering directly into a metal bulkhead. *Electro Methods Ltd., Hitchin St, Biggleswade, Beds.*

Stylish multi-range meter

ATTRACTIVE, contemporary appearance of the "Selectest" multi-range meter conceals workmanlike construction which includes printed-circuit techniques. The meter is available in two models, the "Super K," conforming to the conventions for multi-range meters with d.c. voltage and current ranges from 150 mV to 1,500 V and 1·5 mA to 15 A, respectively, and the "Super 50," a more sensitive instrument having a d.c. voltage sensitivity of 20,000 ohm per volt over the range 250 mV to 2,500 V. The d.c. range on this instrument is from 50 microamp to 10 A. The meters have a.c. ranges with the same maximum value as on d.c. Components are mounted on a printed-circuit board and include germanium rectifiers for the a.c. ranges giving accurate readings over a frequency range of 10 to 25 kc/s for voltage ranges above 75 V, and as high as 100 kc/s below 75 V. Other features are a 6 in. scale with the accent on legibility, anti-parallax mirror and pointer, and long term stability magnets giving accurate reading in any position of the meter. The meter requires two batteries for the resistance ranges and has a reversing button for convenient measurement on the d.c. ranges. The melamine dust-proof case measures 7⅞ in. by 7 in. by 3½ in. and total weight is 5½ lb. *Salford Electrical Instruments Ltd., Peel Works, Salford 3, Lancs.*

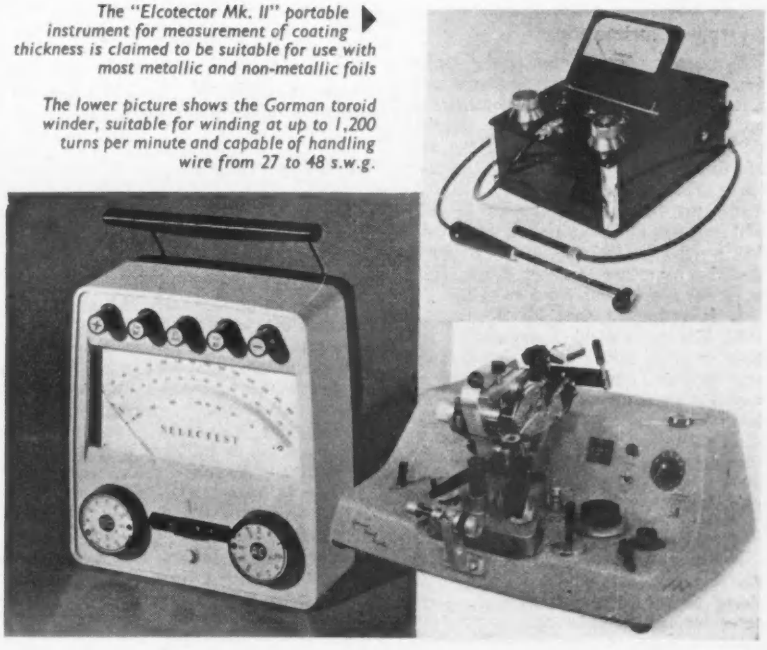
The Salford "Selectest" multi-range meter, housed in an attractive melamine moulded case, is available in two models

Winding toroids at high speed

RECENTLY introduced to this country is the Gorman high speed toroid-winding machine claimed as suitable for winding speeds from 0 to 1,200 turns per minute and using wire from 27 to 48 s.w.g. The core range allows for a minimum finished i.d. of 0·055 in. and a maximum o.d. of 2 in. A feature of the machine is the provision for rotating the cores through any desired angle from 0 to 360° or, alternatively, for a fixed increment of progression on a constant angle of rotation. The machine includes an accurate electronic turns counter and a dynamic braking system to permit stopping from high speed without wire breakage. *Aveley Electric Ltd., Ayron Rd, Aveley Industrial Estate, South Ockenden, Essex.*

The "Elcotector Mk. II" portable instrument for measurement of coating thickness is claimed to be suitable for use with most metallic and non-metallic foils

The lower picture shows the Gorman toroid winder, suitable for winding at up to 1,200 turns per minute and capable of handling wire from 27 to 48 s.w.g.



Mobile welding generator

A WELDING generator has recently been added to the Lincoln range. This is the type SA 200 capable of providing up to 275 A for hand welding or 200 A continuously for metallic arc-welding with either bare or heavily coated electrodes, and also for carbon arc welding. Open circuit voltage is controlled by a shunt field rheostat and a further rheostat is included to give series field control of the welding current. The generator is driven by a 21 b.h.p., air-cooled diesel engine and it is mounted directly on the engine end-bell. The diesel engine, generator and welding control panel are mounted on a covered trailer with pneumatic tyres suitable for fast road towing. *Lincoln Electric Co. Ltd., Black Fan Rd, Welwyn Gdn City, Herts.*

Portable thickness gauge

PRIMARILY designed for the measurement of coating thicknesses on components, the "Elcotector Mark II" is a portable battery operated instrument, developed from the original mains version, which can also be used for surface crack detection and comparison of the hardness of steel components. The instrument is said to be usable for measuring thicknesses of most metallic and non-metallic foils in either the static or moving condition. For industrial use a version is available housed in a wall mounting, lockable cabinet. The "Elcotector" is said to depend on changes in the characteristics of a coil mounted in a probe for the detection of the quantity to be measured. The instrument is fully transistorised and employs a printed circuit. It is housed in a black laminated plastics case weighing, with batteries, nearly 8 lb. *East Lancashire Chemical Co. Ltd., Fairfield, Manchester.*

PROSPECT FOR SEMICONDUCTORS

STRANGE glimpses into a semiconductorised future, albeit confusing to power engineers, were given to a packed audience at the IEE last week by Dr A. F. Gibson and Mr G. King of Standard Telecommunications Laboratories. Mr King told us that he had returned from fog-bound Dartmoor to open the discussion, but it was the terms negative temperature, backward rectifiers and negative mass amplifiers that mystified at least a few members of the audience. However, some consolation derived from the chairman's closing remarks when he commented that, while he was obliged to admit that some of the discussion was above his head, one fact had emerged crystal clear: "That negative resistance at a negative temperature gave positive noise—or was it negative noise?"

Negative noise arose in the discussion on the properties of the tunnel diode, a semiconductor device with the appearance of a transistor, but which was demonstrated to operate happily as part of an audio amplifier while immersed under water in a fish tank complete with fish. A great advantage of the tunnel diode is apparently that it requires no sealing and there is no, as the speaker put it, "claptrap about purity." Three attempts have so far been made to construct a tunnel triode, but they have been only partially successful. The tunnel diode is a two state device with high operating speed and great insensitivity to environmental conditions. Claim for a Japanese version is operation at 30 Mc/s with envisaged use at 100 Mc/s giving an operation time of 10 millimicroseconds.

The negative mass amplifier is the description given to an idea for a device using the properties of holes in germanium. Whether it will work is as yet uncertain, but the speaker said that a similar device working at the temperature of liquid helium could be expected to function.

Among the many new devices appearing, the speaker could refer to only a few, including variable-capacitance diodes, photoresistors and thermal coolers. The thermal cooler is a semiconductor which cools with the passage of current, but although it would form a useful base for temperature sensitive transistors and similar devices, it has the unfortunate feature of requiring ten times the power input for a given cooling power.

Design Thinking

Circuit designers, as one speaker remarked, have had to change their thinking first from the techniques of valve circuits with parameters in hundreds of volts and kilohms to transistors working with volts and ohmic values ranging from tens of thousands to hundreds of ohms. Now, with the new devices requiring only millivolts to operate them, further rethinking of circuitry will be necessary. But one feature of the new devices which is attractive is the possibility of using their light sensitive properties to dispense to some extent with complex electrical wiring, by using controlled light beams instead of wires to link circuit elements.

Aimed specifically at any power engineers present was the comment by Mr King that the Americans have now available a 10 kW controlled silicon rectifier.

European Power Outlook

PROSPECTS for the electricity supply organisations of European countries are discussed in a new UN Economic Commission for Europe publication.* Amongst the significant trends noticed is rapid development of distribution of heat by district heating schemes and production of such heat in stations for combined electric power and heating. In most of the countries using this technique, more heat is produced by back-pressure turbines than by pass-out turbines, but it is thought that use of the latter type will soon begin to increase. In the USSR and Poland, certain power and heating stations are equipped with pass-out turbines provided with condensers so that the turbines can be used as condensing turbines when district heat is not required, as in the summer. A different solution in certain Eastern European countries is the use of condensing turbines with two or three sections on a single shaft, the lower pressure part of which can be uncoupled when steam exhausted from the intermediate pressure section is required for district heating. There is a trend towards the use of water rather than steam for the heating fluid.

Average Consumption

European predictions for power supply development up to 1975 characteristically assume a high average rate of increase up to 1965 with some very gradual slackening of growth towards the end of the 20-year period. The forecasts imply that average European requirements per head of population in 1965 will be 2,050 kW/hr (a rise of 9·0% from 1955). On available evidence it seems that European consumption average may be 3,700 kW/hr per head by 1975.

It is estimated that by the end of 1963 Europe should have about one-quarter more hydro generating capacity and one-third more conventional thermal capacity than at the end of 1958. The increase in capacity of power stations designed to use lower-grade fuels will be disproportionately high. By the end of 1963 about one-half of Europe's total exploitable hydro potential (excluding the USSR) will have been harnessed. In the transmission field close attention is being given to the highest voltages. From some recent studies of economic loads and distances in the USSR, it is suggested that equality between a.c. and d.c. overhead lines, both in capital and energy transport costs, is reached at distances between 700 and 900 km (435 and 560 miles). Important progress is being made in linking up networks of adjoining countries, and it is predicted that most of the countries of Eastern Europe will have been interconnected in this way by the end of 1961.

When progress with trans-frontier transfers of power is discussed, it is necessary to bear in mind that there are important differences regarding the possibilities in eastern and western Europe. In western Europe, the possibilities of transfers will in the future arise largely from greater diversity in demand and production characteristics opened up by extending the interconnected area. In eastern Europe, on the other hand, the pattern of demand and production in the different countries is likely to maintain a much greater basic similarity. An important consideration is that most of the concentration of hydro power will remain unexploited. With these differences arising, the UN commission suggests that a more detailed review of distinctive regional problems and possibilities may be useful.

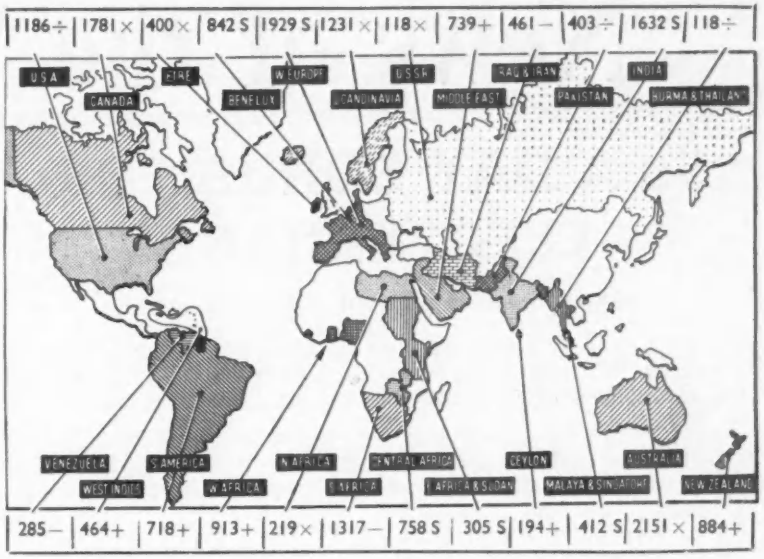
Capital Investment

The unexpectedly high rate of reduction in cost per kW installed of thermal stations has had an effect in Europe just as it has in the UK. Everywhere the acceptable economic limit for nuclear plant is being lowered. Also, in the interests of obtaining the highest short-term return on capital invested in power schemes, there has been postponement of development of some unused hydro sites where alternative possibilities exist. Overall, the economic picture of the European supply industry is reckoned to be tending to become more complex. The increase in international power exchange is another factor affecting this situation. The UN Economic Commission for Europe suggest in the report that the time is ripe for a further study of the comparative economic criteria of plant development in various countries.

* "The Electric Power Situation in Europe for 1958-59 and its Future Prospects," published for UN by HMSO, price 5s (UN Sales No. 60 IIE/Mim 5).

Distribution of Exports in £'000's Sterling

× = over 25% increase
+ = 10% to 25% increase
S = 10% + to 10% −
− = 10% to 25% decrease
÷ = over 25% decrease
on previous year's figures.



EXPORTS IMPORTS

April

RETURNING to the high rate of exports with which UK manufacturers started 1960, the value of electrical exports topped the £24 million mark again in April, but was still some £500,000 below the January total. And in comparing the total against that for the corresponding month last year, it must be remembered that the latter's figure included a £3 million submarine cable order shipped to America.

Compared with exports in March, the total value is nearly £3½ million up, and in this increase the heavy plant side contributed over £1½ million, with generator parts at a very high figure.

Exports of some domestic appliances also increased, notably vacuum cleaners and washing machines. Of fan exports, the ceiling type alone accounted for £108,214 of the total—a sharp increase. It will be seen that electrical imports also continue at a high rate, although about £1 million down on the figure for March, but refrigerator imports achieved a further small rise to £969,617.

Our best customer for the month was Australia with a total of £2,151,430, of which £588,652 related to generating sets and motors, £229,019 for converters, rectifiers, transformers and switchgear, and £43,310 for cables and wires. Exports to Canada, which totalled £1,781,658, included £1,054,657 for generators and motors, and £283,115 for radio and electronic gear.

Description	Exports Value (£)		Imports Value (£)	
	April, 1959	April, 1960	April, 1959	April, 1960
Generators				
Diesel up to 200 kW	338,173	420,516		
Diesel over 200 kW	469,134	206,746		
Steam turbine driven	8,578	63,564		
Water and gas turbines	184,272	482,956		
With i.c. and other prime movers	19,269	7,944	70,727	47,012
Generators up to 200 kW	98,793	141,850		
Generators over 200 kW	114,467	236,935		
Generator parts	842,879	1,470,904		
Motors, f.h.p.	195,467	302,906		
Motors 1-250 h.p.	440,904	489,063	130,001	162,976
Other motors	428,759	472,332		
Motor starters and controllers	330,907	274,800		
Converters and rectifiers	101,597	73,814	58,060	100,267
Transformers	785,069	938,410		
Switchgear, to 200A, mv	347,820	366,970	120,142	108,170
Switchgear, other	1,350,533	1,307,792		
Total, Electrical Plant	*6,056,611*	*7,257,502*	*378,930*	*418,425*
Batteries, primary and parts	518,482	615,915		
Lamps filament, over 28 V	96,639	112,113		
Lamps filament, under 28 V	30,250	32,758		
Fluorescent and other lamps	115,789	107,109		
Radio and electronic gear	3,714,314	4,261,398	1,370,782	1,193,673
Telephone and telegraphic equipment	1,778,158	1,602,834		
Cookers	37,568	55,627		
Toasters	27,580	16,134		
Other cooking appliances and parts	114,472	127,678		
Space heaters	22,718	22,648		
Water heaters	28,322	30,896	283,390	149,302
Other heaters and parts	108,340	99,347		
Electric irons	62,927	62,406		
Vacuum cleaners	126,376	161,785		
Floor polishers	83,642	66,858		
Food mixers	107,209	46,653		
Washing machines, domestic	393,937	524,233		
Dryers		12,714		
Washing machine and dryer parts	72,724	98,847		
Domestic refrigerators and parts	772,479	771,598	200,900	969,617
Other appliances and parts	181,303	238,776		
Total, Domestic Appliances	*2,139,597*	*2,336,200*		
Portable power tools	210,342	282,703		
Arc welding plant	138,742	96,241	89,861	57,358
Resistance welding plant	114,880	29,836		
Electric furnaces	95,525	128,951		
Signalling apparatus	176,768	102,105		
Commercial instruments	185,952	181,717	144,516	130,634
House service meters	116,866	180,832		
Wiring accessories	205,677	213,729		
Fans	77,906	126,016		
Lighting fittings and lanterns	296,764	359,102		
Other lighting equipment	101,542	83,562		
Telephone and telegraph cable	3,413,836	398,167		
Paper insulated cables	546,509	545,418		
Rubber insulated cables	298,162	226,738		
Thermoplastic insulated cables	289,764	355,306		
Winding and similar wires	128,885	140,480		
Other cables and wires	153,773	224,912		
Total, all cables and wires	*4,830,939*	*1,891,021*		
Accumulators and parts	417,327	338,266		
Insulating materials	202,650	191,536		
Electrical ware	116,089	101,561		
Industrial electronic control gear	140,367	184,313		
Permanent magnets	39,283	53,920		
All other articles	2,534,998	3,225,478	1,207,589	1,641,504
Total	24,452,467	24,096,719	3,675,968	4,560,513

News of the Week

5s A DAY BONUS FOR ELECTRICIANS

Only applicable on special new building sites

A BONUS of 5s per day for all adult operatives engaged in the electrical contracting industry working on a few very special building sites has been agreed between the NFEA and the ETU, and the overtime ban has been lifted.

This bonus is to be paid "in recognition of extra effort by operatives employed on the initial construction of buildings reasonably comparable with the Shell building at South Bank, London, and the Petrochemical building at Urmston, Manchester, where building trade operatives are in receipt of bonuses or additional payments arising from payments-by-results schemes."

Whether a building comes within this category or not is decided by the chief officials of the ETU and the NFEA. Where these cannot agree, the matter is to be referred to the NJIC.

This agreement is to operate initially for six months, and is then terminable unless renewed by the two organisations. During that period there is to be further consideration of the present wages structure with a view to exploring whether agreement can be reached on a substitute arrangement.

As a further guide to the scope of this new agreement, it has been accepted by the two parties that possibly there would have been over the past two years less than 12 projects coming within the definition.

First site at which the bonus is operating is the Shell site on South Bank, where the original dispute arose. There, the men will get the bonus in their pay packets this week.

The stipulation for application for the bonus to go through official channels, without local settlement, could cause some difficulty, it has been suggested.

We are told that this procedure has already resulted in deterioration in some quarters, the electricians believing that their claim is being thwarted. Some employers are encountering the argument that there seems no logical reason why a bonus should be paid for work on a 26-storey building, when, in fact, the height might be immaterial to the job in hand.

It is freely admitted that both sides to the agreement have been placed in a difficult position arising from the recommendations of the committee set up by the Ministry of Labour to inquire into the dispute of electricians at the Shell Centre site, South Bank.

That committee recommended that there should be urgent discussions on the question of altering Clause 8 of the National Agreement to permit extra payments on sites where "payment-by-results" schemes are in operation.

Boilermakers' Tie-up?

SOME form of rationalisation is coming in the power station boiler industry, where surplus productive capacity has become a major problem. Discussions on the matter are now proceeding, we understand. Simon-Carves Ltd. have already arranged "a mutually satisfactory method of co-operation with International Combustion Ltd.," Mr R. B. Potter, Simon-Carves' chairman, reveals.

Another Mill for Cable Firm

ANOTHER cotton mill, with 350,000 sq ft of floor space, has been bought by Ward and Goldstone Ltd., manufacturers of insulated wires and cables, electrical accessories and plastics, etc. Reorganisation of the building—Butts Mill, Leigh, Lancs—will start in a few weeks' time, and operations are due to begin before the end of the year, giving employment to some 1,500 people.

Meanwhile the Salford mill acquired by the company last autumn is in the final stages of reconstruction and will soon provide work for 1,000 people.

One million kW for Thermal Storage

THE load for electric thermal-storage installations in Great Britain now exceeds one million kW, while the floor-warming load has almost doubled during the past year, the Electricity Council reports, quoting figures that demonstrate the growing interest in electrical thermal storage methods of space heating which can be operated under off-peak conditions.

Such methods include floor-warming for all types of new buildings, block heaters for industrial and commercial premises, and hot-water storage central-heating systems.

Total electric thermal storage space heating load in Great Britain a year ago was about 750,000 kW, made up of some 350,000 kW of block heaters, 250,000 kW of floor-warming and 150,000 kW of hot-water storage systems.

During the year the overall load increased by some 350,000 kW (of which 200,000 kW is for floor-warming), making a total of 1·1 million kW.

These results, the council suggests, are largely due to the wide acceptance of electric floor-warming as a standard system of heating in domestic dwellings, in addition to other premises. The use of block heaters in commercial and industrial premises also shows a steady expansion, while, in premises not requiring continuous heating, applications for electrode boilers in conjunction with hot water storage continue to be found.

TWO ACQUISITIONS

THE **Firth Cleveland Group** has bought **J. J. Habershon and Sons Ltd.**, specialists in deep-drawing stainless, alloy and electrical steel strip. This firm, which was nationalised at a cost of over £600,000, has served industries as diverse as radio, electricity supply, electronics and agricultural machinery. The group purchased the firm from the Iron and Steel Holding and Realisation Agency for £700,000 and £400,000 for a loan outstanding to ISHRA. The amount will be paid by 30 Sept., 1961.

Dowding and Mills Ltd., of Bordesley, Birmingham, industrial, mechanical and electrical repair specialists, have acquired the business of **Southern Electrical Repairs**, 55 Millrook Rd, Southampton. Mr A. H. Sockett, formerly owner of Southern Electrical Repairs, will continue as Southampton manager for Dowding and Mills. General administration will be centred on the London branch, 24 White Post La, Hackney, E.9, under the management of Mr P. L. Hollings.

Morphy-Richards' HQ

MORPHY-RICHARDS LTD., the holding company of the Morphy-Richards group, has now moved its offices to 50 Conduit St, London W.1. The company's registered office is at the same address, to which all communications for the chairman, the joint managing directors and the secretary should be sent.

Industry consumes more electricity

INDUSTRY continues to consume more and more electricity, according to the latest quarterly figures issued by the Electricity Council. During the first quarter of this year consumption increased by over 16% as compared with the same quarter of 1959, whereas the increase in consumption for the fourth quarter of last year was 12½%.

Notable increases were also recorded in domestic and commercial consumption, the figures being 11·2% and 10%, respectively, as compared with 7·4% and 4·5% for the preceding quarter. Total consumption for the 12 months ended 31 March last was 9·8% up on the previous year, compared with an 8% increase for the 12 months ended 31 Dec., 1959. It should be remembered that the figures contained in the table above refer to units metered or billed during the period concerned.

Electricity sales to consumers in millions of units

Type of Consumer	3 months ended		12 months ended	
	31 Mar. 1960	% gain over last year	31 Mar. 1960	% gain over last year
Domestic ...	9,107·1	11·2	26,899·0	7·9
Farm ...	491·0	3·8	1,514·4	1·1
Commercial	3,686·5	10·0	10,542·8	5·7
Combined Domestic/ Commercial	457·2	9·2	1,380·2	6·9
Industrial ...	12,126·7	16·7	43,104·0	12·8
Public Lighting ...	218·4	8·6	728·7	8·0
Traction ...	411·3	5·0	1,548.4	2·4
Total ...	26,498·2	13·1	85,717·5	9·8

New Service Centres?

REVIEWING the need for new service centres in its area, the East Midlands Electricity Board decided that the localities which "probably deserve the highest priority" are: Bulwell, West Bridgford, Ashby-de-la-Zouch, Hucknall, Alfreton, Bedworth, Sherwood, and Heanor.

Common Market Tariffs Compared

COMPARATIVE figures of tariffs imposed by member countries of the European Common Market on principal British exports were given by the Minister of State, Board of Trade, in answer to a question in the House of Commons last week. Three typical product groups are shown in the table below, which gives the UK tariffs in addition to those levied by the "Six," and also the Common Market external tariff.

Typical U.K. Exports to the "Six", with Applied Tariffs

Item	Current rates of Import Duty in:					"Six" External Tariff %
	UK %	Benelux %	France %	Italy %	W. Germany %	
Refrigerating Equipment	15 17½	6 12	13.5 16.2	14.4- 18.9	2 4	13
Metal-working Machine Tools	10	6 7	6-22	7-25	0 4	4-12
Radio communication and navigation aid equipment	17½ 20 30	10	18-22	16.2- 36	9	16-22

Where more than one figure is quoted in respect of a particular product group, they indicate the different tariffs applicable to categories within the group, e.g., in the case of refrigerators, the tariff depends upon the cubic capacity above or below a specified value. The external tariff shows the level of the barrier which will act against British exports to the Common Market.

Injunctions against E.T.U.

INTERIM injunctions granted in the High Court last week forbid the Electrical Trades' Union to elect an assistant general secretary unless union members received the unedited address of Mr F. J. Chapple, one of the candidates. The latter claimed that important sections had been cut from his address, thereby damaging it.

Mr Justice Danckwerts, giving judgment, said the case depended upon the interpretation of the union's rules. Rule 44 (3) laid down that when any question of interpretation arose, the executive council should have power to determine the meaning, and their decision was binding on members, subject to the right of branches to appeal. But that rule did not oust the jurisdiction of the court to consider the construction of the rules.

It was contrary to public policy for the rules of a body to prevent a member from having his rights considered by the courts.

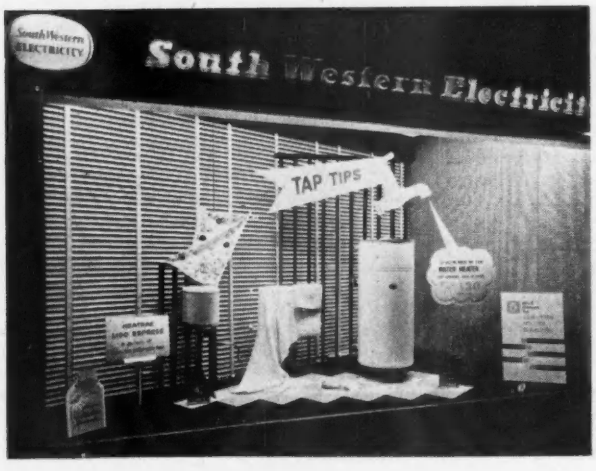
The passages in the election address which the union officers had struck out referred to the work that the plaintiff proposed to perform. The plaintiff, in effect, said he would carry out such work without being deterred by slander or intimidation. His lordship said he could not see how that was not within the terms of rule.

Last week-end the union's executive council decided not to appeal against the decision, but to circulate Mr Chapple's original election address and proceed with the election.

42-hour week for Scottish Electricians

ELECTRICIANS in the installation, contracting and ancillary trades in Scotland are to get their normal working week reduced from 44 to 42 hours, as from the beginning of August. This has been agreed between the Electrical Contractors' Association of Scotland and the Electrical Trades' Union.

The association and the union also announce an agreement for the introduction of a non-contributory sick pay scheme, on 1 Jan. next. Under this, electricians will receive a weekly supplement of £3 10s in addition to payments under the National Health and Industrial Injuries schemes. The benefits will be payable for a maximum of 13 weeks in a 12-month period.



This window won the challenge cup for the brightest and most attractive display in a small electricity service centre in the West Country, namely the Bedminster (Bristol) service centre of the South Western Electricity Board, who organised the competition. The winning team comprised Mr P. G. Locke, Miss M. F. Thomas, and Mrs M. V. Crook. The display features electric water heating. The Frank Forrest Trophy (1960) for the best display in a large service centre was won by Plymouth's New George St centre: team—Messrs H. M. Pope, A. B. Horrell and E. A. Denbow.

OFFICIAL PUBLICATIONS

DSIR Report of Research Council, 1959. HMSO. 4s 6d.

BS Amendment slip: 626, Micanite for commutator separators. PD3672; 3187, Electrically conducting rubber floor, PD 3705.

Harland Transfer

PLANS to reorganise the trading activities of Harland Drives Ltd. (first reported in our 11 Feb. issue) have now been put into effect. The company, from 1 June, is now operating as a division of the parent concern and will trade under the name of The Harland Engineering Co. Ltd.—Drives Division. All orders and contracts placed with Harland Drives Ltd. and unfulfilled on 31 May last are being taken over by Harland Engineering, in whose name invoices and statements will be rendered.

HIGH LIGHTS!

IF all the fluorescent batten fittings installed in New York's Coliseum were placed end to end, they would be three times as high as the Empire State building, or 12 times as high as St. Pauls Cathedral, state Courtney Pope (Electrical) Ltd., who are supplying all the fluorescent fittings to light the British exhibition which opens in New York on 10 June.

£1m 4-year plan to complete S. Wales rural electrification

THE rural electrification of South Wales will be completed by the spring of 1964 under a five-stage development plan approved last week by the South Wales Electricity Consultative Council. The plan, submitted by the South Wales Electricity Board, provides for the construction of 130 major schemes, making electricity available to 2,385 farms and 1,126 other rural dwellings, at an estimated cost of £1,050,000.

With the exception of a few further stages for West Wales, to be submitted to the council in a few month's time, the new proposals will complete electrification under the zonal plan, achieving an 85% overall electrification of farms four years ahead of the date originally forecast.

"In 1948 fewer than 3,000 farms out of a total of 23,500 in South Wales—less than 13%—were connected," Ald E. Kinsey-Morgan, chairman of the council said. "On 31 March this year, 14,827, or more than 63%, were on supply. This increase of almost 12,000 farms, or 50% on the total number in the area, has been achieved at a capital cost of about £4 million."

Simon-Carves Merger Plan

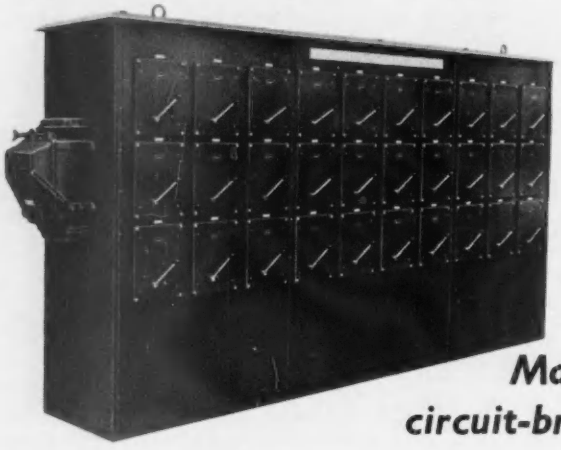
NEW proposals for the merger of Simon-Carves and Henry Simon (Holdings) have now been circulated. Under these, a holding company, Simon Engineering, would be set up to hold shares of the two subsidiaries. Ordinary shareholders of Simon-Carves are offered one Simon Engineering share for each one they hold, plus one 6% Preference for every 15 Ordinary held.

Both sets of Ordinary shareholders will get 5s a share out of surplus cash requirements of the companies and, simultaneously with the creation of the new shares, Simon Engineering would make a one-for-two scrip issue. If the scheme is approved, the outside Ordinary shareholders of Simon-Carves will hold 52·3% and those of Henry Simon 47·7% of the equity of Simon Engineering.

£5m Electricity Loan

A LOAN of £5 million is being raised by the Electricity Board for Northern Ireland by the issue of 5½% guaranteed stock, 1979-82, at a price of £96½ per cent. The list of applications opened and closed yesterday. The stock is a trustee security and interest will be payable half-yearly in April and October. Redemption is at par on 1 Oct., 1982, with earlier redemption in whole or part at par on or after 1 Oct., 1979, at the board's option.

The board is the authorised electricity undertaking for the whole of Northern Ireland except the two county boroughs of Belfast and Londonderry. Unit sales have nearly trebled in ten years from 217 million in 1949 to 612 million in 1959.



This special low voltage a.c. table roller motor control cubicle is one of six manufactured by Chilton Electric Products Ltd. at Hungerford, Berks, for use in the Indian Government's merchant mill at Durgapur, near Calcutta. The cubicle will be used to control the various a.c. table rollers in the mill

Making circuit-breakers pay

SPECIALISING in circuit-breakers can reap rewards, particularly in export markets, as the substantial increase in orders for Chilton Electric Products' range of Atlas HBC circuit-breakers, both for home and overseas, during the past year amply demonstrates.

Among such orders reported by the company were those placed for various quantities of a special type of four-pole Atlas circuit-breakers for the control of separately excited shunt-wound d.c. table roller motors for sheet steel mills in Australia and South Africa. In addition, 139 special circuit-breaker control panels were exported for a.c. table roller motor control for the 24 in. structural mill of the Indian Government at the Durgapur steel works, near Calcutta.

A further order recently exported was for six special a.c. low voltage control cubicles for the Indian Government's merchant mill, also at Durgapur (see picture). Each cubicle, designed and built in Chilton's new switchgear works at Hungerford, comprises a 150 A isolator and 30 Atlas HBC triple-pole circuit-breakers for the control of various a.c. table rollers in the mill.

A new home order consists of 15 control units, built to specification, for use by the Steel Company of Wales in the extension to their Spencer Mill works at Newport, Mon. Many of Chilton's orders are placed by the bigger UK manufacturers as part of major engineering contracts.

Prosper Through Control

"INVITATION to Prosperity" is the title of a new industrial film made in colour for Lancashire Dynamo Electronic Products Ltd. by Technical and Scientific Films. It shows a number of industrial applications of the firm's control equipment and illustrates their design and engineering methods.

Hamstead's Deep Water

A POCKET of water ten fathoms deep close to the shore is the outstanding advantage of the Hamstead, Isle of Wight, site for the proposed South of England nuclear power station, Mr G. N. Stone, of the CEGB, told Yarmouth residents last week. "Nowhere else in the south where we wish to place a nuclear power station does this facility exist," he added.

The Hamstead station would require some 35 million gallons of water an hour. If approval were given for the station, full development of the site would mean that another two power stations would be built on it in due course.

E.D.A. QUIZ FINALS

AFTER six months of good, nationwide publicity, during which 1,000 competing teams were whittled down to four, the final round of EDA's electrical quiz was held before a packed audience at the Albert Hall on 25 May with Franklin Engelmann as questionmaster and Peter West as compère.

Winner of this national quiz for members of the National Union of Townswomen's Guilds was the team from Nantwich; runners-up were Wellingborough, Finedon, Keith and Woodford Plymouth. Prizes of 4 cu ft refrigerators went to each of the four members of the winning team. Second, third and fourth runners-up received tumbler dryers, Kenwood Rotisseries and Belling "Zephyr" radiant heaters.

The women, who had studied EDA's text-book, *All About Electricity*, answered surprisingly complicated and sometimes tricky questions, and though they appeared to have learned the booklet by heart from the way they quoted verbose passages from it verbatim, they certainly knew what they were talking about.

Presiding was Sir Edwin Herbert, president of the EDA, who introduced Lady Dorothy Macmillan, presenter of the prizes. She expressed her admiration at the technical prowess displayed by the teams.

The Nantwich TWG team who won EDA's electrical quiz contest: (left to right) Mrs Nicholls, Sir Edwin Herbert, Mrs Evans, Mrs Barnett, Mrs Fogg, Lady Dorothy Macmillan

D.S.I.R. surveys Research Associations

PROGRESS in co-operative research association receives attention in the annual report for 1959 of DSIR's Research Council. During the year, the number of research associations reached 50 for the first time; the addition was the Water Research Association. The report underlines the importance of co-operative research associations to their members.

"A research association cannot live by research alone," says the report. The result of its work and the technical knowledge and experience of its staff has to be brought to bear on the practical problems of the manufacturers who support it. Thus services for members in the categories information, advice, tests, experimental work and sponsored research are essential.

Regarding DSIR research stations, the report offers a new list of the major purposes for which the DSIR research stations exist. These include dissemination of results of their research, and a taking of positive steps to secure their application. The Research Council recognises that each research station should have freedom to follow up new ideas within its field of interest.

One kWh = 10 housewife hours?

"THERE is no doubt that as far as electricity is concerned the housewife has never had it so good—by the use of a few simple appliances, available at the turn of a switch, she is able to substitute one kilowatt hour of electrical energy for ten housewife hours of domestic drudgery," said Mr S. F. C. Whitmore, deputy chairman of the South Western Electricity Board, at St. Ives last week.

Mr Whitmore was speaking at a lunch following the civic opening by the Mayor of St. Ives (Cllr J. Couch) of the town's new electricity service centre.

Today there were 4,600 consumers in St. Ives, and the demand for electricity was 40 times as great as in 1923, when the town received its first supply, he went on, adding: "Electricity saves the housewife money: for a running rate of only 1¼d an hour she can have a whole staff of 'servants' at her disposal —cleaning, washing, polishing and mixing."

Duty Drawbacks

CHANGES in certain drawback regulations are listed in Import Duty Drawbacks (No. 6) Order, 1960, issued by the Treasury last week, which extends the scope of existing provisions for drawback on certain insulator caps, microphones and earphones for deaf-aids.

Anglo-Polish Trade

A FEW electrical products are listed in the quotas for the new three-year trade agreement between the UK and Poland signed in London last week. Under the agreement the following may be exported from the UK to Poland: electrical insulating materials (£40,000); refrigerators and refrigeration plant, including parts (£25,000); and fractional h.p. motors (£5,000). In addition, £400,000 is allocated for radio and television equipment and components.

The agreement, to be reviewed annually, will increase UK exports to Poland from the figure of £16½ million in 1959 to about £20 million, while Polish exports to this country are expected to rise from £33 million in 1959 to some £35 million.

THE STATE OF BUSINESS

THE trends in business, commerce and industry during recent months, allowing for seasonal adjustments, indicate a progressive improvement in Britain's economic activity, according to the latest Treasury Bulletin. The adjusted figures take into account various fluctuating factors such as holidays, the influence of the weather, differences in number of working days per month, etc., and show the underlying trends, divorced from changes due to random causes. Here is what the figures reveal :

Industrial Production: Rising — first quarter of 1960 2% up on fourth quarter, 1959.

Retail Sales: Rising—first quarter, 1960, 1% up on fourth quarter, 1959, the rise continuing in April.

Unemployment: Falling—number of unemployed in first quarter, 1960, fell more than usual.

Unfilled Vacancies: Rising—more than usual in first quarter, 1960.

Exports: Rising—up 4% in Nov./Jan. on previous three months, and up by another 2% in Feb./April.

Imports: Rising—up 7½% in Nov./Jan. on previous three months, and up by another 2½% in Feb./April.

Incomes: Rising—total domestic incomes 2½% higher in fourth quarter, 1959, than in third quarter. Personal incomes up 1½% in same period. Personal disposable incomes (after tax) up by £53 million.

Consumers' Expenditure: Rising—£96 million (2½%) up in fourth quarter, 1959, following a small fall in third quarter.

Gross Fixed Capital Formation: Rising—in fourth quarter, 1959, both private and public sectors gained 4% on third quarter.

Investment in Stocks and Work in Progress: Rising—fast rate of increase in second half of 1959, with rate of accumulation running at over £300 million a year.

Wath-upon-Dearne, Yorkshire, now has an electricity service centre for the first time. Formally opened last month, the building features a shop frontage of plate glass giving an uninterrupted view of the interior (illustrated), the window line being set back about 4 ft to provide protection from the weather for shoppers. Floor-warming is used throughout. A feature of the main showroom is the architect-designed ceiling in 3 ft by 5 ft units, some of which are boxed in above and contain 5 ft fluorescent tubes with "egg-box" louvres, while others carry tungsten fittings and spot lamps

1,200 MW power station for Scotland

A £50 million 1,200 MW coal-fired power station is being planned by the South of Scotland Electricity Board on a 200-acre site at Preston Links, near Cockenzie, East Lothian. If coal supplies were considered insufficient to support the scheme, however, a nuclear power station could be built instead.

The plan is still in the formative stage. If the site proves to be unsuitable, a station may be built in another part of the country. "All that has been decided is that Scotland should have another power station," a S of S EB spokesman said.

The station envisaged at Cockenzie would have an output of 1,200 MW, requiring 2·7 million tons of coal a year for the first nine years, then falling to 1¼ million tons after 20 years as more efficient plant was installed. Present coal output in the Lothians is four million tons a year, a figure expected to be maintained for at least a century.

Farm pylons to stay

PERPETUAL injunctions to restrain a farmer from interfering with work on electric pylons and power lines across the farmland, for which statutory authority had been given, and from damaging or interfering with them, were granted to the CEGB by Mr Justice Buckley in Chancery Division last week.

The action against the farmer, Mr J. Brynmor Jones, and his father, Mr Thomas Jones, was started in 1957. It was then alleged that the son, after threatening to remove a pylon if his father's claim for compensation was not settled within an hour, had dislodged a pylon from its foundation with a sledge hammer.

Mr G. T. Hesketh, for the CEGB, told the judge that the action against the father had been stayed. The son, who had not filed a defence, was ordered to pay damages and costs.

U.S. - U.K. Factory at Oxted

A NEW factory for the production of selenium rectifiers and silicon diodes was opened at Oxted, Surrey, last week by the International Rectifier Co. (Great Britain) Ltd. The company is a joint venture by Metal Industries Ltd. (initiated by Lancashire Dynamo) and the International Rectifier Corporation of Los Angeles, one of the world's largest suppliers of industrial metallic rectifiers.

The opening ceremony was performed by Sir John Vaughan-Morgan, M.P., formerly Minister of State at the Board of Trade, who actuated a solar cell, which operated a motor and this dropped a white ribbon stretched across the factory door. Sir John said the factory was a magnificent example of Anglo-American co-operation. It was encouraging to see that in a world hungry for capital, America had confidence in the future of Britain.

Outer Seven Trade Quotas

A COMPREHENSIVE range of electrical products which are subject to global quota restrictions within the European Free Trade Association from 1 July next is listed in the *Board of Trade Journal* dated 27 May. Quota lists have been drawn up in accordance with Article 10 of the EFTA Convention by Austria, Denmark, Sweden and Switzerland. The Norwegian and Portuguese lists will be notified later.

The products listed will be subject to quota, but will carry the first of the planned tariff cuts (20%) between member countries of the Outer Seven.

Housewives Quizzed on Cookers

CLEANLINESS is by far the most important reason why housewives buy electric cookers in preference to gas. This fact emerges from a survey conducted by the Modern Cooking Promotional Committee among 1,500 Birmingham housewives who bought new electric cookers in November and December last year, and so had six months' experience of their use.

From the answers given to a series of questions put by the committee, the following salient points become evident:

Nearly seven out of ten housewives chose an electric cooker for cleanliness, and just over one out of ten for economy. Safety and ease of control accounted for 5% of the reasons given.

Most popular features of electric cookers were: ease of cleaning (21%), auto-timer (20%), speed of cooking (14%) and economy (10%). On the other hand, of those housewives who had bought cookers with auto-timers (72%), nearly a quarter admitted to using the auto-timer "infrequently," and one out of ten "never." Of the remainder, 17% used the auto-timer once a week, 15% twice a week, 12% three times a week, and so on in decreasing proportion.

Cooker colours chosen showed a near balance between white (51%) and cream (41%), the rest being made up of other colours. A third of the housewives had previously owned an electric cooker, while 57% had changed from gas and 10% had not owned a cooker at all.

Furnace for India

A CONTRACT worth £40,000 for a direct arc melting furnace to be installed at Dandeli, Mysore, India, has been placed with Birlec-Efco (Melting) Ltd. by Electro Metallurgical Works Private Ltd. The furnace, arranged for a 90° nose-tilt, will be hydraulically operated, and when completed will be, it is claimed, the only one of its kind in India. Rated at 1,200 kVA, it will be used for the production of ferro-manganese.

Transmission and Distribution Convention

LECTURES on electricity supply transmission and distribution subjects are to be given during a three-day convention organised by the Enfield Technical College, Queensway, Enfield. The lecturers will be members of the staff of the Eastern Division, CEGB, and of the Eastern Electricity Board. The course is open to electrical engineers working in the field who have reached an academic standard of HNC or above. Fee for the convention is £2 10s (including luncheon) and application should be made to Head of the Department of Electrical Engineering, Enfield Technical College, Queensway, Enfield.

£2,500 for shocked girl

AGREED damages of £2,500 and costs were last week awarded against the MO Valve Co. Ltd., Hammersmith, to a 23-year-old girl who, in 1955, received an electric shock from a welding machine while working in the company's factory. The girl, Delia Hueston, of County Armagh, N. Ireland, collapsed in the High Court witness box after telling the judge how the shock had changed her personality. "I do not go out to parties or dances now, because I can't go into crowds—I would faint," she said.

Her counsel said that the company admitted liability, and the question was whether Miss Hueston was suffering from a post-traumatic neurosis or was malingering.

Giving evidence, a consultant psychiatrist said that Miss Hueston was not malingering; a clenched condition of her right hand was hysterical, and in her general condition there was a personality change of a hysterical nature. She was well on the way to recovery—until she saw a film in which the hero had a limb amputated. "That caused her to have a relapse."

Cornwall Reorganised

A FURTHER reorganisation involving amalgamation of districts has just been completed by the South Western Electricity Board. The former West and Central Cornwall districts have been merged, with the title of West Cornwall and headquarters at Camborne, while the North and South Cornwall districts are merged to form the new Mid-Cornwall district, with headquarters at Bodmin.

The new district managers are noted on page 898.

Sayings OF THE WEEK

"It is a matter of conjecture whether we ought not to be preparing our plans for use of 25 amp plugs and sockets for domestic purposes." . . . MR T. E. DANIEL, paper to the British Electrical Power Convention.

"Just as it is the job of the production engineer to persuade management to carry out new methods of production on an economic justification . . . the safety officer should make his case on economics and produce the ample evidence that safety is no different from all other activities of management." . . . MR R. H. COATES, Southern Divisional Controller, CEGB, speaking at National Industrial Safety Conference.

"We may not like werewolves in sheeps' clothing, but we must encourage the cubs in apprentices' overalls." . . . MR F. FOULKES, president, at the ETU conference.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, May 31

	£ per ton	Weekly change £
COPPER, standard class A (settlement)	238½	−9½
" (3 months)	236⅝	—
LEAD, refined pig, 99·97% purity (cash)	75⅝	−2⅜
" (3 months)	76⅛	−1⅛
TIN, refined, min. 99·75% purity (settlement)	782½	+1
(3 months)	783½	+1½
ALUMINIUM, ingots 99-99·5%	186	—
" wire bars (4×4×54")	193½	—
BRASS Strip 63/37	213	−5½
SILVER (Troy oz)	79¼d	−⅛d
ZINC, virgin, min. 98% purity (cash)	91½	−⅜
" (3 months)	90⅝	−1
RUBBER, per lb. No. 1, R.S.S. spot	36¼d	−2⅛d
c.i.f. basis, ports, Aug.	35½d	−⅛d
ARMOURING: Galv. Steel Wire (0·104 in.)	66½	—
Mild Steel Tape (0·04 × 1⅛ in.)	53*	—
NICKEL (home)	600	—
MERCURY (76 lb flask)	70⅛	—
AMERICAN PRICES: Copper, electrolytic (per lb)	33c	—
Lead (New York)	12c	—

* *Tape Price, now an average, includes varnishing*

NO TAX ON "KNOW-HOW"

THE sale of technical knowledge and "know-how" by industrial companies is a capital transaction not subject to tax assessment by the Inland Revenue, it was held by Mr Justice Pennycuick in the Chancery Division last week in dismissing, with costs, four appeals by the Crown against decisions of the Special Commissioners for Income Tax allowing appeals by Rolls-Royce Ltd. against tax assessments arising from the sale of technical knowledge.

The appeals concerned assessments on the company's profits amounting to over £15 million for the years 1948-55. The judge referred to an agreement with the Chinese Republic in 1946 under which the Chinese were licensed to manufacture Rolls-Royce jet engines. The company received a "capital sum" of £50,000 and a royalty on the number of engines made in China.

The company contended that their store of technical knowledge and secret information was a fixed capital asset. The Crown's contention was that the lump sums paid under the agreements were normal trading receipts of a revenue nature.

Kent shows why

THE reason for the choice of a site in Kent for a nuclear power station is the theme of an exhibition to be staged in three Kent towns this month. The exhibition will be held at the Memorial Hall, Lydd, from 3 to 6 June; at the Town Hall, Folkestone, from 14 to 18 June; and at the Corn Exchange, Ashford, from 23 to 25 June. The show features the nuclear power station project at Dungeness.

News in Brief

The new electric train services between Liverpool Street and Chingford, Enfield, Hertford (East) and Bishop's Stortford will be introduced on 21 Nov., 1960.

Local authorities in the north-east are being asked by the regional committee of the Royal Society for the Prevention of Accidents to set up a consultative committee to bring about a uniform system of street lighting on classified highways.

An order worth £250,000 for an Orion electronic digital computer has been placed with Ferranti Ltd. by the National Institute for Research in Nuclear Science. The computer will be installed at the institute's Rutherford High Energy Laboratory at Harwell.

Nearly 400 members and guests attended the annual reunion of the AEI Willesden Long-Service Association at Wembley Town Hall.

Electrolux News, staff magazine of Electrolux Ltd., received a certificate of merit in the British Association of Industrial Editor's National House Journal Competition.

I.E.A. AGAIN IN 1962

THE next Instruments, Electronics and Automation Exhibition will be held from 28 May to 2 June, 1962, it was announced last week when the 1960 exhibition closed at Olympia. The exhibition is held bi-annually.

More than 75,000 people attended this year's exhibition, an increase of 15,000 on 1958, even though this time the show was open for only six days compared with eight on the previous occasion. Among the visitors were nearly 4,000 technologists, engineers and industrialists from 61 countries overseas, with the Russian delegation already on the threshold when the exhibition opened, and the Hungarians not far behind.

Probably the most significant feature of this year's exhibition was the considerable increase in its size, calling for much more selective stand touring on the part of visitors, also the conference held concurrently with it on electronic applications. German firms exhibiting on a number of stands were prominent this year, certainly dominating the overseas exhibitors. Their exhibits ranged from data handling and scientific equipment to circuit-breakers and auxiliary devices for domestic appliances.

Company Activities

A GREAT deal of the mountain mist uncertainty which descended upon the foothills of Throgmorton Street following the Summit storm now seems to have dispersed and Stock Exchange dealings last week were characterised by a new-found buoyancy. An expression of this is to be found in the behaviour of the *Financial Times* index for industrial Ordinary shares (based upon the price movements of 30 leading "Blue chips") over the past few weeks. After dropping to a 1960 "low" of 295·8 on 9 May (13·7% down on 4 Jan. "high" of 342·9) the index reached a pre-Summit 311·1, relapsed on the Paris set-back to 309·9 and then last week went further ahead to 320·4. So that in a space of just over two weeks the index has climbed £8 6s in every £100 to stand at only 6·5% below the year's "high."

Three weeks ago I gave it as my view that the severe marking down of heavy electrical issues had been overdone. Last week brought a welcome marking up. Over the week the £1 Ordinary shares of GEC improved from 37s 10½d to to 40s 9d, while Elliot-Automation climbed 3s 6d to 25s. Of those heavy electrical companies sharing the contracts worth £7·13 million placed by the Central Electricity Generating Board during the past two months for power stations, etc., AEI surged ahead from 54s 1½d to 57 9d, English Electric improved from 38s 10½d to 41s 6d, while over the week C. A. Parsons put on 2s at 52s 6d and Reyrolle at 40s 3d ex the one-for-one free scrip issue were an equivalent of 80s 6d against 75s 9d.

British Insulated Callender's Cables, however, who were among those to win orders for overhead cables, after rising to 52s 9d closed the week only 1½d better at 52s 3d. No doubt the shares are being held in check by the annual statement from Mr W. McFadzean, who points out that the cable price increases which have been edging upward since the middle of 1959 "have by no means brought us back to overall economic levels." The fact that a sizeable proportion of mains cables is sold under yearly contract, so making it several months before the new prices can benefit the group is also a restraining reminder made by Mr McFadzean. At 52s 3d the £1 Ordinary shares of BICC now yield 5·2% with the 13½% dividend twice covered by earnings, and have been as high as 61s earlier this year.

Before venturing investment wise into this field, however, one's imagination should spend a few moments evaluating the possible future prospects of cables in communications. My preference would be for frozen food—where the 1970 demand is estimated at 6½ times today's —or Philips Lamps. Philips Lamps and this column, in fact, appear to be playing a private and persistent game of leap-frog. No sooner have I expressed an opinion upon their price and potential than they have "done it again." I now have to report that on strong Amsterdam buying they have been up to 201s 3d and are now simmering around 198s 9d.—*From our City Correspondent.*

Allen West and Co.

With prospects brighter than a year ago, Mr M. W. H. Lancaster, the chairman, reports that orders received last year were 16% higher than in 1958 and the unexecuted order position is higher than it has ever been. But the increasing complexity of the type of equipment means an increasing amount of time required to "engineer the job" in the offices relative to the time spent in manufacture and assembly.

Aron Electricity Meter

Acting for unnamed clients, Ridge Securities have made an unconditional offer of 68s 6d each for the £1 shares, but last week-end the market price touched 69s 6d. Aron made a net loss of £17,194 in the year to 31 March, 1959, but maintained the 15% dividend which has been paid for over ten years.

Bowthorpe Holdings

The first five months of the current year show increased sales and output, Mr J. Bowthorpe, the chairman, states. In 1959 sales were 9% up but profit margins were reduced, particularly in the last half of the year. The board have investigated a number of projects with a view to acquiring a controlling interest in companies which could be merged in the group, but the prices asked have not been considered reasonable, he adds. But they are anxious to increase the group's activities by acquisition of other concerns.

Brook Motors Ltd.

For the six months to 31 March last, group profit is £366,222 (*£317,834*). As there have been no changes in prices, the increased profit is due entirely to a considerable increase in volume of trade, both home and overseas, and the directors add that there are signs that this improvement will continue throughout the year. At present all departments are fully employed, and the order book position is satisfactory.

Burco Dean Ltd.

The interim dividend is reduced 1% to 5% and the directors anticipate a final of 10% will follow, making 15% —3% down on the previous year. Transfer of production to the new factories has been almost completed and a new washing machine launched. These changes caused some disorganisation, but turnover is now increasing and the company's business is on a satisfactory profitable basis, although profit margins are lower than last year.

Copeland and Jenkins (Holdings)

For the year ended 26 Dec. last, profit amounted to £208,511 (*£159,313*) before tax charge of £103,162 (*£78,147*). A final dividend of 8% on the increased capital maintains the total at 14%.

Electronic Trust

It is proposed to make a one-for-four rights issue at 25s 6d per £1 share. The board expects to pay a 4% dividend on the old capital for the year to 31 May, 1960, and to maintain the rate on the larger capital the following year.

Heatrae Ltd.

With the net profit (after tax) increasing to £24,759 (*£15,.56*), the dividend is also raised 2½% to 22½%.

Metal Industries Ltd.

Provisional allotment letters have been circulated for the issue of one new £1 Ordinary, at 54s, for every £4 Ordinary held. Altogether 1,479,600 shares are being issued, providing £3,880,000 net.

Reason Manufacturing Co.

Net profit for the year to 31 Jan. last is £4,191 (*£4,197*), and dividend is 20%.

Simon-Carves Ltd.

Group results for 1959 were a record, being 10% higher than in 1958, and with the order book somewhat higher than a year ago the prospects for the next few years are encouraging, Mr R. B. Potter, the chairman, reports. On the nuclear side, he fears that the labour difficulties experienced at Hunterston, although now settled, will delay the commissioning of the station at least 12 months.

Transformers (Watford) Ltd.

The factory output reached a record level last year, and despite the lower profit margins trading profit shows an upward trend, Mr A. T. Worboys, chairman, stated at the annual general meeting last week. Additional land and buildings immediately adjacent to the factory have been purchased and a new main assembly shop to handle units up to 100 tons is being built. Value of orders on hand at the close of the year was not unsatisfactory.

Unidare Ltd.

Net profit for the year to 31 March last is £140,783 (*£120,768*), and the dividend is raised 2½% to 12½%. It is proposed to create and issue 500,000 7% Redeemable Cumulative Preference £1 shares.

Intended Dividends

Crompton Parkinson. Interim 5%.

Plessey Co. Interim 7% (6%) on larger capital.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

2 June—Belfast T.C. (1) Additions to installation at Graymount Secondary School for Girls, Gray's La; (2) electrical installation at Blythefield Junior Primary School, Blythe St.—See 26 May issue.

3 June—Bristol C.C. Electrical installation by contractors on N.I.C.E.I.C. Roll in four additional classrooms at Four Acres Primary School. Applications to City Architect, Council Hse, Bristol 1, by above date.

3 June—Rothwell U.D.C. Provision and erection of 494 Group "B" 45 W lighting on reinforced or prestressed concrete columns.—See 26 May issue.

3 June—Southend-on-Sea B.C. Electrical installation in Wentworth High School. Borough Architect, 30 Alexandra St.

4 June—Carrickfergus B.C. Supply of 20 2 ft and 10 4 ft fluorescent lanterns and mounting brackets. Town Clerk, T. McVea, Town Hall, Carrickfergus, Co. Antrim.

7 June—Belfast. Electrical and mechanical services installations in new club-house and changing-rooms, Stockman's La, for Instonians R.F.A.—See 26 May issue.

7 June—Lancs C.C. Rewiring of Reedley, Radcliffe and Wigan Police Stations. County Architect, P.O. Box 26, County Hall, Preston. Applications quoting reference A/G by above date.

7 June—Ripley U.D.C. Installation of sodium discharge lighting along Cromford and Heabe roads.—See 26 May issue.

7 June—Southend-on-Sea B.C. Supply of 50,000 yd 3/-029 flat twin, 16,000 yd 7/-029 flat twin and earth, 2,000 yd 7/-029 single cable plus switches, switch-plugs, lampholders, etc. Borough Engineer, Municipal Bldgs, Clarence Rd.

8 June—Ormskirk U.D.C. Supply and erection of 28 Class "A" and 67 Class "B" concrete columns, lanterns, sodium lamps and gear.—Advertised 26 May issue.

9 June—Belfast C.C. Supply of (item 1) r.f. induction heater and servo mechanism components. College of Technology, College Sq East, Belfast 1.

10 June—Belfast C.C. Supply of a 12 in. bore parallel slide steam valve. Specification W.177, from Electricity Dept., East Bridge St, Belfast 1.

10 June—Inverness C.C. Installation of street lighting including trunk road lighting at Newtonmore and Carrbridge.—See 26 May issue.

10 June—Stamford. Erection and installation of 32 Group "A" mercury lighting units on steel columns, together with two illuminated bollards for A1. Stamford By-pass roundabout lighting for M. of Transport.—Advertised 26 May issue.

10 June—Skipton R.D.C. Renewal or partial renewal of electrical installations in 33 houses at Eastburn, Steeton and Sutton. Engineer and Surveyor, Granville St, Skipton.

11 June—Bournemouth C.B. Electrical installations in: (1) Hill View Rd Junior School; (2) Summerbee Junior School, East Way; (3) Kinson Junior School; (4) East Howe Boys' and Girls' Secondary School, Hadow Rd; (5) Stourfield Mixed Secondary School, Beaufort Rd.—See 26 May issue.

11 June—Chesham U.D.C. Supply and erection of 49 Group "A" steel columns with 250 W colour corrected m.v. lanterns together with 24 Group "B" columns with 125 W m.v. lanterns with all lamps and control gear.—Advertised 19 May issue.

11 June—Havant and Waterloo U.D.C. Supply of (Item 14) cables and fittings for year.—See 26 May issue.

13 June—Aireborough U.D.C. Supply and installation of Class "B" m.v. street lighting along six roads, divided into two contracts: (1) supply and erection of columns, brackets, fitting and wiring of lanterns to columns; (2) supply of lanterns and auxiliary gear. Engineer and Surveyor, Micklefield Hse, Rawdon, Leeds. Deposit £2 2s.

13 June—Antrim C.C. (a) Electrical installation in Carrickfergus Grammar School. Details from McAuslan, Abbott and Partners, 16 Bedford St, Belfast. Deposit £3.

13 June—Brighton C.B. Electrical installation, on fixed-price basis, at Teachers' Training College, 1 and 2 Percival Terr.—See 26 May issue.

13 June—Co. Antrim. Electrical installation in new pig progeny testing station at Greenmount Agricultural College estate, Muckamore, for M. of Finance.—See 26 May issue.

13 June—Lancs C.C. Supply to county establishments of electric cooking equipment, hot cupboards, etc. Details to County Architect, County Hall, Preston.

13 June—Limerick T.C. Supply and erection of 5,500 g.p.m. unchokeable pumps for Galvone Sewage Pumping Station. City Engineer, Arus na Cathrach.

13 June—Manchester C.C. Electrical installations in shops, maisonnettes and garages, Peel Hall neighbourhood unit.—See 26 May issue.

13 June—West Hartlepool C.B. Supply of 15 ft, 25 ft and 35 ft tubular steel plus 15 ft and 25 ft concrete columns; 140 W sodium, 80 W and 125 W colour corrected mercury and 100 W tungsten lanterns and control gear. Borough Engineer, J. S. Miles, Municipal Bldgs.

14 June—Co. Antrim. Provision of electrical engineering services in new boiler-house, Hopefield Hospital, Portrush, for Hospital Management Committee.—See 26 May issue.

15 June—Havant and Waterloo U.D.C. Installation of immersion heaters in 529 houses. Engineer and Surveyor, 1 Park Rd North, Havant.

15 June—Manchester. Electrical installations in following: Contract 222G, five shops and maisonnettes; 320, 16 dwellings; 324, 81 flats; 300, 27 dwellings; 326, 193 dwellings; 295, 133 dwellings. Details from Director of Housing, Town Hall.—Advertised in this issue.

16 June—Fylde Water Board. Electrical installation in Head Offices, Blackpool.—Advertised 26 May issue.

16 June—Llanfrechfa Lower P.C. Supply and erection of 49 Group "A" steel columns with 140 W sodium lanterns, ancillary gear and underground cabling. Alternatively: 38 35 ft steel columns with 200 W sodium lanterns for A4042 lighting at Croesyceiliog.—See 19 May issue.

17 June—Down C.C. (a) Electric lighting and heating installation at new child health clinic, Park Ave, Newcastle.—See 26 May issue.

20 June—Batley B.C. Supply of 140 W and 60 W sodium lanterns and control gear; 140 W and 60 W sodium lamps and jackets; solar dial time switches, wall boxes and back plates. Details from Borough Engineer, Hanover St, Batley.

20 June—Cardiff T.C. Electrical installations in Stacey Rd schools on fixed-price basis. Details from and £2 2s deposit to City Surveyor.

20 June—Newcastle T.C. Supply of sodium and colour corrected mercury vapour lighting lanterns complete with control gear. Details from F. S. Taylor, General Manager, Transport and Electricity Comm., Manors.—Advertised in this issue.

20 June—Romford B.C. Supply, erection and wiring of 62 Group "A" and 12 Group "B" sodium street lighting units. Borough Engineer and Surveyor, Town Hall. Deposit £2 2s.

21 June—Birmingham T.C. Electrical installations, on fixed-price basis, in shops, maisonnettes and flats at Leach Green estate. Contract No. 631. Documents from and deposit £2 2s to City Engineer and Surveyor, Sir Herbert J. Manzoni, Civic Centre.

22 June—Dunbartonshire. Electrical installation in N.A.T.O. Common Infrastructure Slice VII contract: P.O.L. Storage Depot at Rosneath. The work, value £10,000, includes f.l.p. 415 V distribution and control equipment, lighting and heating. Applications to Director-General, Navy Wks, Admiralty, Chamberlain Way, Pinner, Middx, by above date.—Advertised in this issue.

23 June—Belfast C.C. Electrical installation in proposed dining room extension to Maldon St School meals kitchen. Education Architect's Dept., 40 Academy St, Belfast 1.

27 June—Manchester C.C. Electrical installation including lighting, underfloor heating and small power to control building, Arnfield Treatment Wks, Tintwistle. City Architect, P.O. Box 488, Town Hall.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 108 queries answered this week

"Lyndon" conduit thread stocks and dies—makers of? E.E.W.—Tom Carrington and Co. Ltd., Stony La, West Bromwich, Staffs.

"Multari" measuring instruments—agents for? C.A.—Kandem Electrical Ltd., 711 Fulham Rd, S.W.6.

"Yaxley" switches — address for? M.O.H.—N.S.F. Ltd., Ingrow Bridge Wks, Keighley, Yorks.

"Unicorn" irons—makers of? L.E.B.—British Unicorn Ltd., 36 Southampton St, W.C.2.

Filtavac Ltd.—address for? O.D.C.—Kensington Hse, Ventnor, Isle of Wight.

"Braun" shavers—agents for? L.E.—Ronson Products Ltd., 352 Strand, W.C.2.

"Rowlett" toasters — makers of? S.W.E.B.—Rowlett Engineering Co. Ltd., East Rd, Burnt Oak, Edgware, Middx.

"Systoflex" tubing— suppliers of? C.-A.—Spicers Ltd., 19 New Bridge St, E.C.4.

"Primax" soldering irons—agents for? W.W.—S. Kempner Ltd., 29 Paddington St, W.1.

ANSWER WANTED

"Visualarm" alarm systems—makers of? F.E.

28 June—Manchester C.C. Supply and erection of 415 V cables and auxiliary equipment for secondary sludge treatment plant at Davyhulme Sewage Wks extensions.—Advertised 26 May issue.

9 July—Bridgwater B.C. Supply and erection of 200 sodium and mercury/fluorescent lamps on 15 ft prestressed concrete columns plus the conversion of 50 tungsten units to mercury/fluorescent; contract includes the supply and jointing of underground cables. Borough Engineer, Town Hall. Deposit £2 2s.

18 July—Irwell Valley Water Board. Supply and erection of automatic electric pumping plant, Whitfield, to deal with constant 2 m.g.d. flow. Documents from and deposit £2 2s to Engineer and Manager. Water Office, Parsons La, Bury, Lancs.

Date not stated—Scotland. Supply of 1-200 kW 440 volt motor-driven induction heating generator, complete with condenser cubicle and all associated switchgear. Reply to Munro and Miller Ltd., Sighthill Industrial estate, Edinburgh 11.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

18 June—Sudan. Ten 4·5 kW diesel generating sets. Assistant General Manager (Supplies), Sudan Gezira Board, Barakat. B.o.T. (ESB/13554/60).*

21 June—Sudan. 230/240 V lamps, 15 items from 15 to 200 W in quantities of between 50 and 5,000. Controller of Stores, Ministry of Works, Khartoum. B.o.T. (ESB/12699/60).*

22 June—Ceylon. Four items of transmission line equipment including 33 tons galvanised steel earth conductors, 15 tons galvanised steel stay wire, stay rods, earth pipes, cotton tape, cable compound, copper and aluminium tape. Tender Board, Ministry of Transport and Power, P.O. Box 547, Colombo. B.o.T. (ESB/12479/60).*

23 June—Australia. Transmission line fault locator. Design Engineer, Hindmarsh Bldg, Grenfell St, Adelaide, South Australia. B.o.T. (ESB/13288/60).*

23 June—India. 600 tons electrical steel sheets, dynamo grade and electrode core wire. Government of India, Iron and Steel Controller, 33 Nataji Subhas Rd, Calcutta 1. B.o.T. (ESB/12443/60/D.L.F.).*

27 June—Australia. 3·3 kV, 150 MVA air break switchgear for Vales Point Power Station for boiler auxiliaries boards. Commercial Manager and Secretary, E.C. of N.S.W., Box 5257 G.P.O., Sydney. B.o.T. (ESB/13526/60).*

30 June—India. H.T. cables. General Manager, Singareni Collieries Co. Ltd., Khairatabad P.O., Hyderabad-Dn 4. B.o.T. (ESB/12632/60).*

4 July—Sudan. 15 tons cadmium copper wire (70 lb per mile) to B.S.S. 175/1951. Controller of Stores and Workshops, Dept. of Posts and Telegraphs, Light Industrial Area, Khartoum South. B.o.T. (ESB/12976/60).*

8 July—Australia. Control and metering cubicles for Tennyson Power Station. Chief Engineer and Manager, Dept. of Electricity, Brisbane C.C., 32 Adelaide St, Brisbane. B.o.T. (ESB/13135/60).*

11 July—Sudan. Five items comprising 2,200 telephones. Controller, Stores and Workshops, Dept. of Posts and Telegraphs, Light Industrial Area, Khartoum South. B.o.T. (ESB/12977/60).*

13 July—New Zealand. Two 550 V d.c. switchboards. Wellington City Corpn., Electricity Dept., Wellington. B.o.T. (ESB/13571/60).*

22 July—India. Transformers and switchgear for 33/66 kV step-up substation at Delhi. Chief Engineer (North), Project Section, Punjab State Electricity Board, 9 Ram Bagh Palace, Patiala. B.o.T. (ESB/13534/60).*

25 July—India. Steel towers, insulators and accessories, 1,180 miles ·2 sq in. a.c.s.r. conductors, 240 miles of 19/·093 galvanised steel ground cable, earthing equipment, etc., for 102 miles of s.c. and 130 miles of d.c. transmission lines. Chief Engineer, Gujarat Electricity Board, Kothi Compound, Raopura, Baroda. B.o.T. (ESB/13545/60).*

1 Aug.—Australia. Seven 330 kV 133 MVA s.p. auto-transformers. Commercial Manager and Secretary, E.C. of N.S.W., Box 5257 G.P.O., Sydney. B.o.T. (ESB/13524/60).*

22 Aug.—Australia. Supervisory type control board showing N.S.W. power system with two control consolettes and three communications desks, etc. Commercial Manager and Secretary, E.C. of N.S.W., Box 5257 G.P.O., Sydney. B.o.T. (ESB/13523/60).*

Gazette Announcements

COMPANIES ACTS

Domestelec Ltd. Mr R. McNeil, 43 Church Rd, Hove, appointed liquidator at extraordinary general meeting of members on 26 April.

Wares (Portsmouth) Ltd. Mr M. D. Brewer, 14 Hampshire Terr, Portsmouth, appointed liquidator as from 16 May. Creditors to send details to liquidator by 11 June.

Lamberts Electrical Ltd. Creditors to send details to liquidator, G. Talfourd-Cook, 64/65 St. Mary's Butts, Reading, by 24 June.

Cowley Electrical Ltd. and **R.V.R. Components Ltd.** Creditors to send details to liquidator G. Talfourd-Cook, 64/65 St. Mary's Butts, Reading, or R. A. Hawker, 1 John St, Bedford Row, W.C.1, by 24 June.

Estreich Electrical Co. Ltd. Mr S. Primost, 65 London Wall, E.C.2, and A. W. Hunter appointed liquidators as from 17 May. Creditors to send details to liquidator, S. Primost, by 30 June.

Unique Products (Bridlington) Ltd. Mr R. W. Hellyer, Brotherton Chmbrs, Westgate, Leeds 1, appointed liquidator as from 20 May. Creditors to send details to liquidator by 24 June.

Lydiate Television and Electrical Co. Ltd. Meeting of creditors to be held at Chartered Accountants Hall, 5 Fenwick St, Liverpool 2, on 8 June.

Carlton Electrical Co. Ltd. General meeting of members to be held at Woolgreaves, Sandal, Wakefield, to receive the liquidator's report.

Universal Electrical Appliances (Mayfair) Ltd. Winding-up order dated 9 May. First meetings of creditors and contributories to be held at Room 401, Inveresk Hse, 346 Strand, W.C.2, on 2 June at 11.30 a.m. and 12 noon respectively.

D.I.D. Ltd. Resolution for voluntary winding-up passed at extraordinary general meeting on 12 May. Creditors to send details to liquidator, R. H. Hellyer, Brotherton Chambers, Westgate, Leeds 1, by 12 June.

Easiway Electrical Co. Ltd. Creditors to send details to liquidator, L. H. Shipton, 31 Lloyd St, Manchester 2, by 30 June.

Hare and Hooker Ltd. Creditors to send details to liquidator, D. Kroll, 35 Dover St, W.1, by 15 June.

Partnership Dissolved

Partnership between M. J. D. Jones and R. L. Holloway, direct sellers, carrying on business as Household Electrical Appliances at 14 Blackstock Rd, N.4, dissolved as from 3 May. Debts to be paid by R. L. and W. G. A. Holloway, who are continuing the business.

BANKRUPTCY ACTS

Public Examinations

Bradford. D. Cornish, electrical engineer, contractor and hardware retailer, carrying on business as Cornish and Graham at 6 and 8 Maperton Rd, Bradford 3. Public examination: 10.30 a.m. 19 July at County Court, Manor Row, Bradford 1.

Liverpool. R. Bond, electrical dealer, carrying on business as B.B. Machines (Liverpool), at 361 Eaton Rd, West Derby. Public examination: 10.30 a.m. 26 July at Court Hse, India Bldgs, Water St, Liverpool 2.

Receiving Order

Croydon. R. A. G. Newman, electrical dealer, lately trading as Nordon Electrics at 109 Stanstead Rd, S.E.23. Receiving order dated 18 May.

Appointment of Trustees

Wakefield. J. J. Franey and E. L. Bailey carrying on business in co-partnership as Regent Electrical Co. at 77 Barnsley Rd, South Elmsall. Mr P. Cardwell, 93 Queen St, Sheffield 1, appointed trustee as from 3 May.

High Court of Justice. A. H. Elliott, building and electrical contractor, carrying on business as Ellimente Contractors and Ellimente Electric Co., at 127a West End La, N.W.6. Mr R. L. Davis, 58 Theobalds Rd, W.C.1, appointed trustee as from 5 May.

High Court of Justice. A. S. Evans, electrical contractor, carrying on business at "Wayside," West Rd, Bridport, Dorset. Mr A. W. Hunter, 418/422 Strand, W.C.2, appointed trustee as from 17 May.

Dividend

Birmingham. H. Rose, electrical contractor and dealer, carrying on business as Rose Electrical Service at 158 Soho Rd, Handsworth. Dividend per £: 6¼d payable at Official Receiver's Office, 37 Temple St, Birmingham, on 7 June.

TRADE NOTES

Changes of Address. Royce Electric Furnace Ltd. and the Metal Welding and Fabricating Co. have moved to Albert Drive, Sheerwater, Woking, Surrey. Telephone Woking 5401. The Nottingham office of Cambridge Insrument Co. is now at Century Insurance Building, Milton St. Telephone Nottingham 42612.

New Factory. Lumitron Ltd. have acquired a new 25,000 sq ft factory at Willesden, but the premises at 180 Shaftesbury Ave, W.C.2, continues the main showrooms with trade counter facilities for clients in the West End.

Extension. Wolf Electric Tools Ltd. have extended their branch at Strathcona St, Scotstoun, Glasgow 3.

CONTRACTS PLACED

Oxford T.C. Rewiring 193 houses on Gipsey La estate, Holliday Hall and Stimson Ltd., £6,985. Recommended.

Bermondsey B.C. Relighting programme Phase 1, Erecon Ltd., £16,400. Recommended.

Southgate B.C. Street lighting work: supply and erection 630 columns and lanterns, Engineering and Lighting Equipment Co. Ltd., £7,339 and £5,174; electrical services, Eastern Electricity Board, £7,045. Recommended.

London C.C. Electrical installations at: Loraine estate, Jenkins Electrical Ltd., £12,622; Princes Meadow estate, Samuel Reed and Sons Ltd., £3,090; White Hart La estate, Eastern E.B., £4,569; renewal at Robert Louis Stevenson Primary, Sir Wm. Collins Secondary (annexe) and St. Richard of Chichester R.C. Secondary School, Powis Electrical Co., £6,319. Provision of water heaters in 494 dwellings, Watling estate, Hendon. F. J. Baynes and Co. Ltd., £29,376.

BUSINESS PROSPECTS

Aberdare U.D.C. Tender: 70 Cwmdare dwellings.

Angus C.C. Tender: 71,000 sq ft Seaton Rd Junior Secondary School, Arbroath. Architect.

Ascot. Moiret and Wood, 181 Queen Victoria St, E.C.4, architect for nine-storey Royal Ascot Hotel planned.

Ashton-under-Lyme. Corporation propose by-pass area industrial estate.

Bedford B.C. Tender: 24 flats, 18 houses, Eastcotts estate. Engineer.

Blackburn. J. S. Duxbury and Son plan Atlas Paper Wks, River St, extensions.—T. Gillibrand plan Cherry St extensions.—British Rd Services (Parcels), Hammerton St, plan Lower Rosegrove La transport depot offices, canteen, etc.

Blyth. C.W.S. Building Dept., Benton Rd, Newcastle, contractors for £300,000 Blyth Co-op. Society emporium.

Bodmin B.C. Tender: 18 Trelawney Rd bungalows. Surveyor.

Burnley. Massey's Burnley Brewery, Bridge End, plan Parker La area shops, offices, social club, etc.

Canterbury T.C. Tender: Simon Langton Grammar School, new laboratory, Architect.

Cardiganshire. Tender: 18 houses for Carmarthenshire and Cardiganshire Joint Police and Fire Authorities. Architect.

Carlisle. Wholesale Chemists Ltd. plan Burgh Rd Estate warehouses.

Carlton U.D.C. Tender: 60 Phoenix Farm estate houses, Scheme No. 90. Engineer.

Chester-le-Street R.D.C. 122 Ouston houses planned. Architect.—Regent Oil Co., Hendon Dock, Sunderland, plan filling station. A. M. J. Forrest, Middleton Hse, Middleton-in-Teasdale, is architect.

Croydon. R. Cromie, 10 Manchester Sq, W.1, architect for Friends Rd office block for S. Croydon Investments Ltd.—Robert Atkinson and Ptnrs, 13 Manchester Sq, W.1, architects for Park La concert hall, etc.

Darlington. British Rd Services, 222 Marylebone Rd, N.W.1, plan Haughton Rd road haulage depot.—**B.C.** Skerne Park estate infant and junior schools planned. Architect.

Dewsbury. Newlay Concretes, Thornhill Wks, Calder Rd, plan engineers' shop and canteen.

Durham. Geo. Wimpey, Orchard Hse, Fenwick Terr, Newcastle 2, contractors for C.C.'s £639,462 Billingham Campus school halls.—T. Worthington and Sons, 178 Oxford Rd, Manchester, architects for Hatfield College accommodation and flats.—Remand home planned at Brasside. County Architect.

Edinburgh. Drambuie Liqueur Co., 12 York Pl, plan Easter Rd whisky bond. Special fire precautions expected.—**T.C.** Tender: 124 Comiston houses. City Architect.

Enfield. Bowyer and Bowyer architects for E. Osmond Ltd., Millmarch La premises.—S. V. Carter plan Alexandra Rd factory.—G. R. Wright and Sons plan Ponders End Mill extensions.—United Flexible Metallic Tubing Co. plan South St factory extensions.

Enfield. Jamelson Property Co. plan Lincoln Rd area five-storey office block.

Epsom and Ewell B.C. Tender: 24 two-storey West St flats. Engineer.

Essex C.C. Tender: Burnham-on-Crouch Branch Library. County Architect.

Exeter. E.B.C. and Sleaman, Melbourne St, contractors for £200,000 St. Luke's College extensions.

Glasgow. Slater, Rodger and Co., 401 Scotland St, Glasgow S.1, plan bonded store extensions, Seaward St.—Harland and Wolff Govan Shipbuilding Wks, Glasgow, plan Clydebrae St blacksmiths' shops.

Hamilton T.C. Tender: 22 Mary St houses and garages. Architect.

Harlow New Town. Development Corporation plan £60,000 Temple Fields factory/offices for R. F. Thompson (Engineers).

Havant. Jno. Croad Ltd., Portland St, Portsmouth, contractors for £250,000 Stein Atkinson Vickers Hydraulics factory.—Marsh Plant and Machinery Co., 23 South St, Emsworth, Hants, plan £11,000 industrial buildings at New Rd.—Tampax Ltd. plan 55,200 sq ft area Dunsbury Way factory.

Hillsborough R.D.C. Tender: New Council Offices. Architect: Wm. Barklie Maxwell, 5 University Terr, Belfast 7.—Tender: 154 houses, Milltown. Above architect.

Hull. "B" Group Hospital Management Comm., Cottingham, plan £440,227 De La Pole Hospital and Pashby Hse improvement scheme.—**T.C.** Tender: 132 Boothferry estate dwellings. Architect.

Ilford B.C. Tender: Three adjoining three-storey flat blocks, Green La. Engineer.

Ince-in-Makerfield. William Park and Co., Wigan, plan purchase of 10-acre Ince-Forge site by their present holding.

Keighley B.C. Tender: 93 Hainworth Wood Rd estate houses. Architect.

Kingswood U.D.C. Tender: Four two-storey flats, ten houses, New Cheltenham Rd and Dawn Rise. Engineer.

Lancashire. Grayston Plant and Engineering Co., 68 Victoria St, S.W.1, plan Haydock Industrial Estate workshop/offices block.—Rimmer and Barker, Newton-le-Willows, plan engineering workshops.

Larne. East Antrim Hospital Management Comm. plan £100,000 Moyle Hospital block.

Leeds. Tender: office block for National Deposit Friendly Society, Eastgate. Architects, Ansell and Bailey, 12 Gray's Inn Sq, W.C.1.

London. A. E. Symes Ltd., 236 High St, E.15, contractors for £100,000 British Oil and Cake Mills proposed extensions.—E. Hill and Ptnrs., 22 Borough High St, S.E.1, architects for David Greig Ltd, Webber St factory extensions.—Thompson, Walford and Fielder, Leadenhall Bldgs, E.C.3, architects for £100,000 Goldsmiths Company hall of residence, Wicham Rd, Brockley, S.E.4.—L.C.C. to re-house Garnett College at £461,000.—Trollope and Colls Ltd., Noble St, E.C.2, contractors for Chesterfield Properties £750,000 Vauxhall Bridge Rd offices.—£4 million 22-storey office block planned for Army and Navy Stores, Victoria St, S.W.1.—Planned for Victoria, S.W.1: two 10-storey office blocks, one 8-storey, one 16-storey, one 27-storey and multi-storey car park for City of London Real Property Co. Howard, Fairbairn and Ptnrs, 81 Piccadilly, W.1, are architects.

Maidstone. L. C. Roberts, 92 Avenue Chmbrs, Vernon Pl, W.C.1, quantity surveyor for Sutton Valence School boarding house.

Manchester. Joseph Grewe and Co. plan Crabtree La paper works extensions—D.C.D. Co., Eccles New Rd, plan Hulme Hall La warehouse/offices.—Morrison and Associate Companies, Bryanston St, W.1, plan £35,000 reconstruction of Market St and Pall Mall premises.

Manchester C.C. Centre Grammar School for Girls planned and High School of Art, Gorton Mount.

Mansfield. R. L. Jones and Co., St. John's Wks, plan Corporation St factory extensions.

March U.D.C. Tender: 20 three-bedroom houses, 22 two-bedroom bungalows, Upwell Rd. Architect.

Margate. Extensive zoning of land for industry by Corporation Industrial Development Committee at Westwood.—G. A. Harvey plan Ramsgate Rd factory.

Middlesbrough. Newcastle Hospital Board plan new department at General Hospital.—Shannon (Contractors), 44 Marsh Rd, plan 46 Blue Bell Grove bungalows.

Middlesex C.C. Trent Pk College men's and women's hostels, canteen and communal block planned.

Nelson. J. and J. Cash Ltd. plan Edward St industrial building, 10,000 sq ft.

Newcastle. P. H. Knighton, Regional Hospital Board's architect, Benfield Rd, architect for £219,304 ward block, Ashington Hospital. Newcastle Breweries plan Helver St office block.

New Mills U.D.C. Tender: 23 aged persons' bungalows. Architects: Turner and Benson.

Northolt. Belvue Rd, Percy Bilton Ltd., 52 Uxbridge Rd, W.5, contractors for £25,000 Peboc Ltd. extensions, Belvue Rd.

Northumberland. Grammar school, at the Hydro, Hexham, planned. County Architect.

Nottinghamshire. Ravenseft Properties Ltd., 52 Charles St, W.1, plan Calverton shopping centre.

Penybont R.D.C. Tender: three schemes including 50 dwellings and 31 dwellings on housing sites in district. Surveyor.

Peterborough. British Transport Commission, Marylebone Rd, N.W.1, plan Mayors Walk offices and workshops.—Diesel Equipment, 2 Milton St, plan Chapel St workshop, etc.

Plymouth. A. French and Ptnrs, Pearl Assurance Hse, Royal Par, architects for £132,000 factory/offices Burrington estate.—M.L. Engineering plan Burrington factory.

Prudhoe. S. W. Milburn and Ptnrs, 9 Esplanade, architects for £430,000 Monkton Hospital extension scheme, stage 3.

St. Marylebone B.C. Applicants for inclusion on list of contractors from whom tenders will be invited for blocks of flats. Housing Director.

Sandhurst. Wilson Lovatt and Sons, 16 Grosvenor Cres, S.W.1, contractors for £150,000 Royal Military College.

Sedgefield. Leslie and Co., builders, 80 Woodland Rd, Darlington, plan 24 Rughyford houses.

Sheffield. Regional Hospital Board plan casualty dept. at Nottingham Eye Hospital.—S. W. Milburn and Ptnrs, 9 Esplanade, Sunderland, architects for £7,996,000 Heath medical teaching centre.

Shipley. Moore Johnston, 154 Sunbridge Rd, Bradford 1, plan factory.

Shipley U.D.C. Tender: 45 Valley Rd flats. Surveyor.

Shotley Bridge. Newcastle Regional Hospital Board plan hospital outpatients' dept.

Somerset C.C. Tender: Divisional Fire Brigade Headquarters, Yeovil. Architect.

Southampton. Basil Spence, 1 Canonbury Pl, N.1, architect for £130,000 Southampton University theatre.

Stafford. Sir Percy Thomas and Son, 10 Cathedral Rd, Cardiff, architects for £1½ million English Electric factory.

Stalybridge. Range Boilers Ltd., Bridge St, to buy more Bride St land from Corpn.

Stevenage. N.W. Met Regional Hospital Board plan hospital and training school, £3 million.

Stoke-on-Trent. Lewis's (Staffordshire) plan Hanley Store.

Suffolk. Howard Farrow, Russel Par, Golders Green, N.W.11, contractors for £180,000 Gainsborough Cornard factory, Sudbury.

Swindon. Western Region British Railways plan training school.

Teddington. National Physics Laboratory plan £350,000 additions. Ministry of Works architects' dept., John Islip St, S.W.1.

Tynemouth. M. J. Liddell and Sons, Gt. North Rd, plan 12-acre Beaconsfield site development. Possibly four block 10-storey flats and two multi-storey hotels.

Tyrone. C.C. £100,000 old people's home, Omagh, planned.

Wandsworth B.C. Tender: 23 flats and maisonnettes, Spencer Pk. Architect.—Tender: 22 houses and flats, Clapham. E. R. Saxonsnell, 6 New Sq, W.C.2.

Wigan. Edmund Taylor plan Skull Hse La factory extensions, Appleby Bridge.

Wigtown C.C. Tender: 41 houses, five sites. Architect.

Wilton (N. Yorks). I.C.I. plan £86,000 recreation club, Grangetown. Own architects.

Wilmslow. The Airport Development Co., Manchester, plan £800,000 hotel.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

Ambra Ltd., 38 Bankburn Rd, Liverpool 13. To carry on business of factors, importers and wholesale distributors of electrical equipment, etc. Nom. cap.: £100. Dirs.: Emmanuel N. Oliva and Edith J. P. Oliva.

Appliance Servicing Ltd. To carry on business of electricians, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: A. Hagdrup and Iain F. Shaw, 115 Leadenhall St, E.C.3.

Astronautical Development Co. Ltd., 65 London Wall, E.C.2. To develop, market and exploit inventions and patents relating to electrical, aeronautical and other apparatus, etc. Nom. cap.: £1,000. Dirs.: Nicholas S. Japolsky, Alfred H. S. Candlin and Joseph M. Japp.

L. P. Bishop (Leicester) Ltd., 77 Uppingham Rd, Leicester. To take over business of a retailer of radio, television and electrical apparatus carried on at Leicester by L. P. Bishop, etc. Nom. cap.: £5,000. Dirs.: Leslie P. Bishop and Dorothy E. Bishop.

L. H. Brian and Co. Ltd., 118 Rhymney St, Cardiff. To take over business of armature winding, electrical rewinding and general electrical repairs carried on at Cathays, Cardiff, by Leslie H. Brian, etc. Nom. cap.: £500. Permanent managing dir.: Leslie H. Brian.

Brian Hodgson Ltd., 34 Poulton St, Kirkham. Electrical contractors, etc. Nom. cap.: £100. Dirs.: Brian Hodgson and Beryl I. Hodgson.

Brunel Electro Installations Ltd., 35 Bow Rd, E.3. Electrical engineers and contractors, etc. Nom. cap.: £2,000. Dirs.: Ronald G. D. Purdy, Edward G. West and John E. M. Wood.

City Electronics (Cardiff) Ltd., 69 Carlisle St, Splott, Cardiff. Nom. cap.: £1,000. Dirs.: Sidney C. Hughes and Edward G. Hoyle.

R. B. Crowther, Beech Tree Hse, The Strand, Bromsgrove, Worcs. To carry on business of electricians, etc. Nom. cap.: £1,000. Dirs.: Ronald B. Crowther and Mrs Miriam L. Crowther.

Dursley Electrical Services Ltd., 10a Silver St, Dursley, Glos. Nom. cap.: £1,000. Dirs.: Albert Court, Mrs Violet G. Court and Royston A. Court.

Eico Electronic Manufacturing Co. Ltd., Delamere St, Crewe, Ches. Nom. cap.: £5,000. Dirs.: James Reekie, William Atkinson and Ronald Franklin.

Electricals (Mining) Ltd. Electrical and mechanical engineers and contractors, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Ben P. Brant and Donald E. Strong, Lloyds Bank Chmbrs, Collingwood St, Newcastle upon Tyne 1.

Electronic Improvements Ltd., 15-16 Buckingham St, W.C.2. Nom. cap.: £5,000. Dirs.: to be appointed by subs. Subs.: Samuel Martyn, Mrs Rose Martyn and M. Noble.

Electroniques (Felixstowe) Ltd., 47 Croydon Rd, Caterham, Surrey. Nom. cap.: £1,000. Dirs.: Ronald A. Wilson, James D. W. Ormandy and Derrick E. Stollery.

ETA Electrical (Bloxwich) Ltd., 188 High St, Bloxwich, Staffs. Nom. cap.: £1,000. Dirs.: Eric Mew, John A. Mew and Michael R. Bartlett.

Ferndown Electrical Co. Ltd., Ringwood Rd, Ferndown, Dorset. Nom. cap.: £500. Dirs.: Alfred H. Higbee, Horace J. Higbee and Frederick G. Hall.

Frank Ewington Ltd., 2 Windsor Court, High St, Rugby. Manufacturers of and dealers in washing machines, refrigerators, vacuum cleaners, etc. Nom. cap.: £1,000. Dirs.: Frank Ewington and Phyllis G. Ewington.

J. D. Heslop and Partners Ltd., 230 Strand, W.C.2. Mechanical, electrical, precision and general engineers, etc. Nom. cap.: £100. Dirs.: John D. Heslop and Anthony J. Richards. Subs.: Wm. E. Back and Ronald W. Boroughs.

Hughes Electrical Ltd., 8 St. Johns Rd, Worthing. Electrical contractors, etc. Nom. cap.: £100. Dirs.: Donovan W. Hughes and Clifford Hughes.

H. D. Kirk (Stereoelectrics) Ltd., 144-152 Higher Bridge St, Bolton. Designers, manufacturers of and dealers in electrical appliances, etc. Nom. cap.: £2,000. Permanent dirs.: Harold D. Kirk and Mrs E. Kirk.

Linvar Ltd., 5 Balfour Rd, Weybridge. Manufacturers of and dealers in electronic equipment, etc. Nom. cap.: £5,000. Dirs.: not named. Subs.: Kenneth V. Moss and George J. Levers.

Lumiere Ltd., 199 Piccadilly, W.1. Dealers in and manufacturers of lamps, etc. Nom. cap.: £100. Dirs.: John Francis and Michael P. Sherren.

Newlyn Electronics Ltd., The Fradgan Newlyn, Penzance, Cornwall. Nom. cap.: £1,000. Permanent dirs.: John S. Knubley and Brenda H. A. Knubley.

Panlights Ltd., 156 Strand, W.C.2. To carry on business of distributors of manufactured goods, including lampshades and lighting fittings, etc. Nom. cap.: £100. Dir.: Gerald F. Hoe.

Pennine Refrigeration and Electrical Co. Ltd. Nom. cap.: £100. Dirs.: David E. Ellyard, 596 Barnsley Rd, Sheffield and Anthony Koffman.

Precision Jigs Co. Ltd., 79 Caterham Ave, Barkingside. Electronic and automation engineers, etc. Nom. cap.: £100. Dirs.: Stanley C. Hoare and Ashley C. Hoare.

Relax Domestic Appliances Ltd., Abbey Hse, Victoria St, S.W.1. Manufacturers of and dealers in electro-domestic appliances, etc. Nom. cap.: £20,000. Dirs.: Francesco Casarini, Giuseppe Frus and Ronald A. Butcher.

D. Robinson and Co. Ltd., 717 London Rd, Hounslow, Middx. Manufacturers of and dealers in electrical components for automatic control, panel controls, etc. Nom. cap.: £1,000. Permanent managing dir.: Donald B. H. Robinson.

Rogers of Chertsey Ltd., 46 Esher Rd, Walton-on-Thames, Surrey. Electricians, electrical, radar, radio, wireless and television engineers, etc. Nom. cap.: £100. Dirs.: Norman C. Rogers and Winifred Rogers.

Seagen Co. Ltd., 9 Neilsons Yard, Creek Rd, East Molesey, Surrey. To carry on the business of manufacturing electrical engineers, etc. Nom. cap.: £1,000. Dirs. Desmond A. E. Seage, Mrs Irene Seage and William Morton.

Schick Incorporated (U.K.) Ltd. Manufacturers of and dealers in electrical and mechanical dry shavers and electrical goods, etc. Nom. cap.: £50,000. Dirs.: to be appointed by subs. Subs.: T. M. Lane, 7/8 Norfolk St, W.C.2; and Peter J. N. Presland, 23a Tedworth Sq, S.W.3.

Transitron Electronic, S.A. British address: 7-8 Norfolk St, Strand, W.C.2. Registered in Switzerland. Capital: Swiss francs 50,000. To assemble, manufacture, purchase and sell electronic products, etc. Name of person authorised to accept service: Terence M. Lane.

Weylite Ltd., Orchard Cottage, Orchard La, Alton, Hants. Manufacturers of and dealers in electrical goods, etc. Nom. cap.: £500. Dirs.: Roger J. Graham, Doreen M. Graham and John N. Graham.

Whix (Electric) Ltd., 119 City Rd, E.C.1. Nom. cap.: £100. Manufacturers of and dealers in domestic appliances, etc. Dirs.: Alexander Barakan and Jas. H. Hayes.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Banfrost. B792,369. Class 11. Refrigerating and defrosting apparatus. Heron Heating Devices Ltd., Ardea Wks, Church St, Newcastle-on-Tyne 6.

Barmaster. B795,356. Class 7. Machines for washing glasses, etc. Dishmaster (London) Ltd., Kenwood Wks, Mapley St, Old Woking, Surrey.

Cedco. 798,843. Class 9. Switchgear, conduit materials, etc. Claremont Electrical Distributing Co. Ltd., 18 Cricklewood Broadway, N.W.2.

Conex. 791,519. Class 9. Connectors, etc. Sealectro Corpn., 610 Fayette Ave, Mamaroneck, New York, U.S.A.

Conhex. 791,520. Class 9. Apparatus, etc. Sealectro Corpn., 610 Fayette Ave, Mamaroneck, N.Y., U.S.A.

Dame. 800,137. Class 9. Apparatus, etc. De Havilland Propellers Ltd., Manor Rd, Hatfield, Herts.

Double Eagle. 799,839. Class 9. Sound recording and reproducing apparatus, etc. R. J. Barton, 29b Randolph Cres, W.9.

Martindale. 773,725. Class 7. Spray guns, etc., 773,726. Class 8. Grinding implements, etc. 773,727. Class 9. Vacuum Cleaning apparatus, etc. 773,728. Class 11. Air heating devices for attachment to the nozzles of blowers, etc. Martindale Electric Co. Ltd., Westmorland Rd, N.W.9.

Mixoblen. 785,386. Class 7. Mixing machines, etc. Esge Gschwend and Spingler K.G. Electromotoren-Und Apparatebau, 5-9 Burgstrasse, Neuffen-Wurtemburg, Germany.

Perdio. 784,860. Class 9. Apparatus. Perdio Ltd., 14a St. Cross St, E.C.1.

Sappho. 800,320. Class 9. Sound recording and reproducing apparatus, etc. Trix Electrical Co. Ltd., 1/5 Maple Pl, Tottenham Court Rd, W.1.

MEETINGS TO NOTE

MONDAY, 6 JUNE

A.S.E.E. (Bournemouth Branch). "Work of the National Inspection Council," E. J. Sutton. Grand Hotel, Firvale Rd, Bournemouth. 8 p.m.

A.S.E.E. (Essex Branch). A.G.M. Angel Hotel, Ilford. 7.15 p.m.

TUESDAY, 7 JUNE

A.S.E.E. (Portsmouth Branch). A.G.M. Offices of Ministry of Labour and National Service, Lake Rd, Portsmouth. 7.30 p.m.

A.S.E.E. (W. London Branch). A.G.M. Windsor Castle Hotel, 134 King St, W.6. 7 p.m.

A.S.E.E. (Reading Branch). A.G.M. Southern E.B., Vastern Rd, Reading. 7.30 p.m.

WEDNESDAY, 8 JUNE

WOMEN'S ENGINEERING SOCIETY. A.G.M. Hope Hse, 45 Gt. Peter St, S.W.1. 7 p.m.

A.S.E.E. (Birmingham Branch). A.G.M. Birmingham Exchange and Engineering Centre, Stephenson Pl, Birmingham 2. 6.30 p.m

THURSDAY, 9 JUNE

INSTITUTION OF CIVIL ENGINEERS. A.G.M. Gt. George St, S.W.1. 5.30 p.m.

A.S.E.E. (Bradford Branch). A.G.M. Midland Hotel, Bradford. 7 p.m.

A.S.E.E. (S.W. London Branch). A.G.M. Prince of Wales Hotel, S.W.19. 7.15 p.m.

FRIDAY, 10 JUNE

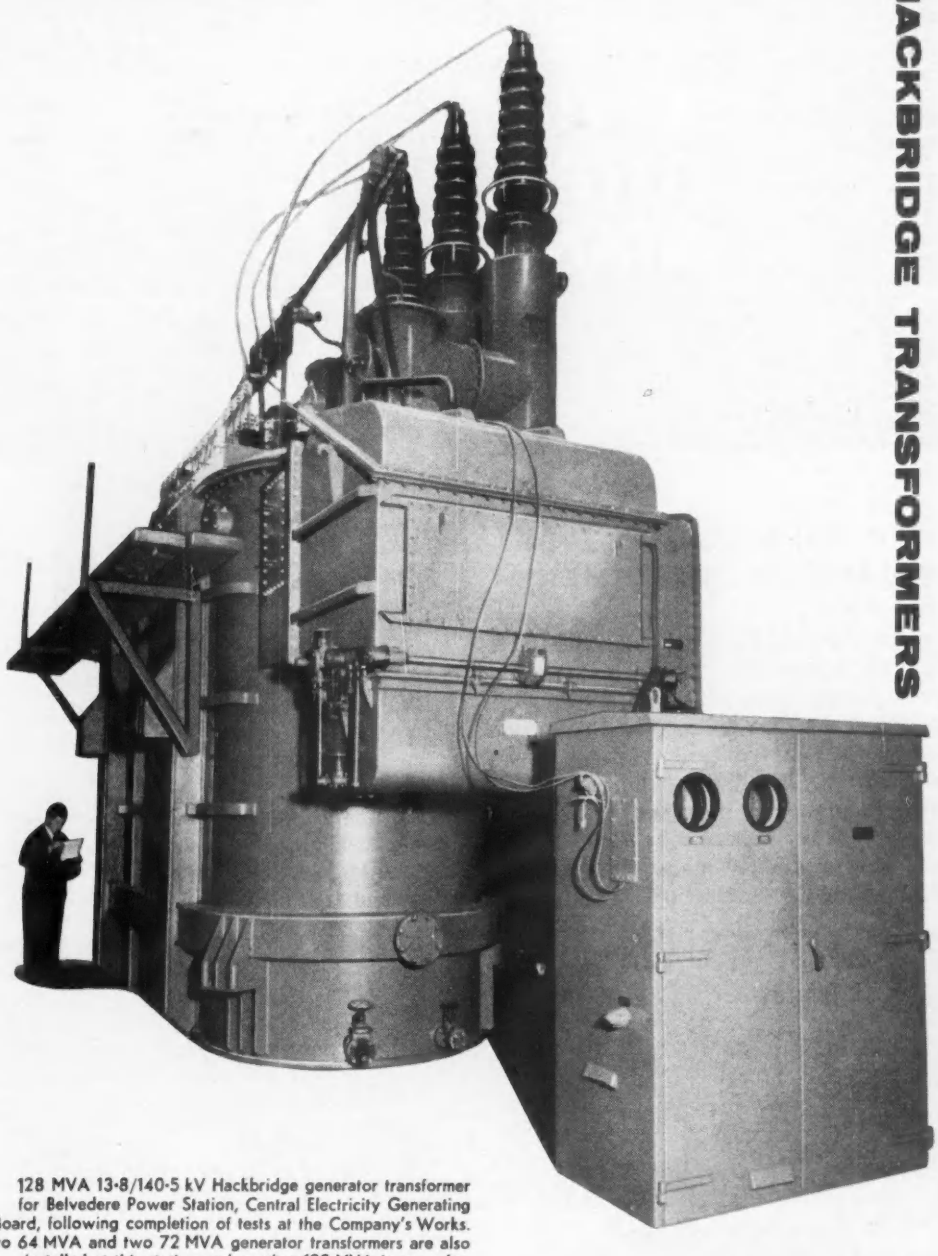
A.S.E.E. (Stoke and Crewe Branch). A.G.M. Grand Hotel, Hanley. 7.30 p.m.

A.S.E.E. (Luton Branch). "Diesel Electric Locomotives." Luton College of Technology, Park Sq, Luton.

TUESDAY, 14 JUNE

E.A.W. Visit to Port of London Authority Navigation Service. 2 p.m.

HACKBRIDGE TRANSFORMERS



128 MVA 13·8/140·5 kV Hackbridge generator transformer for Belvedere Power Station, Central Electricity Generating Board, following completion of tests at the Company's Works. Two 64 MVA and two 72 MVA generator transformers are also installed at this station and another 128 MVA is on order.

every type, size, and voltage

HACKBRIDGE AND HEWITTIC ELECTRIC COMPANY LTD

HERSHAM · WALTON-ON-THAMES · SURREY

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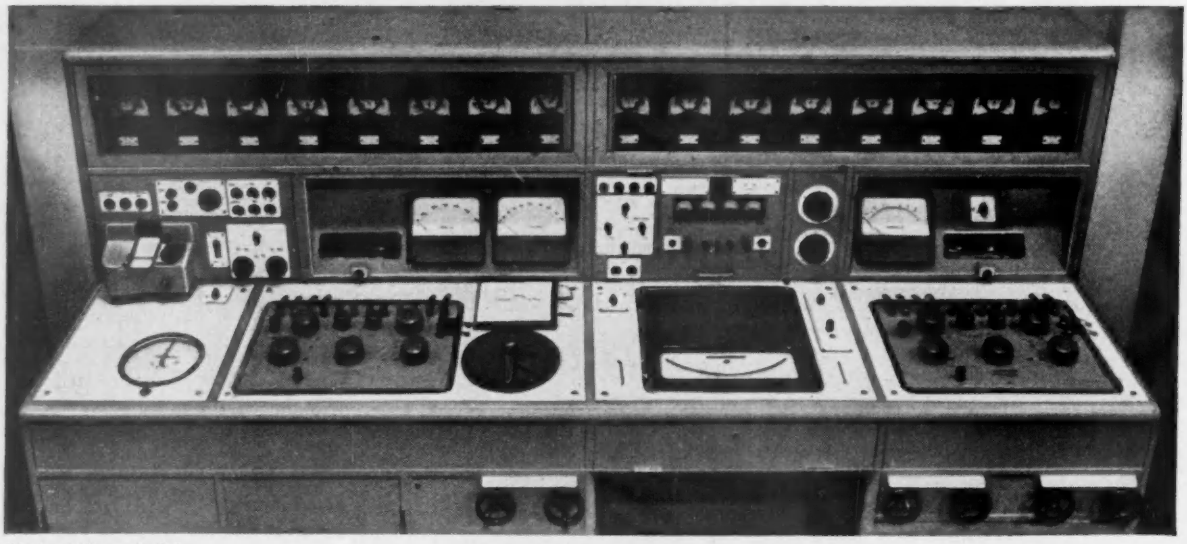
Telegrams & Cables: "Electric, Walton-on-Thames"

SETTING THE STANDARD

MODEL S 200
STANDARDISATION EQUIPMENT

The Standardisation Bench is the heart of the electronic testing equipment which ensures extreme accuracy of calibration of all S 200 meters. A Laboratory Standard Wattmeter and a crystal controlled electronic timer, reading to 1/10th of 1 millisecond, are used for the daily checking of the Rotating Standard. d.c. potentiometers are installed for the regular checking of the Laboratory Standard Wattmeter.
A large Rotating Standard dial presents the average speed of 4 very closely checked Standard Meters. Separate sets of four Standard meters being maintained for each of the various frequency ranges in which meters are supplied. The Standardisation Bench is used to check the Master Meter in each control unit in the final calibration line.



Electronically controlled Standardisation Bench.

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MODEL S 200-7 SINGLE PHASE WATTHOUR METER

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Years ahead of its time!

SANGAMO WESTON LTD · ENFIELD · MIDDX · ENGLAND · Tel: Enfield 3434 (6 lines) & 1242 (6 lines) · Grams: Sanwest, Enfield.

SW/90

CLASSIFIED ADVERTISEMENTS

TENDERS INVITED

CITY AND COUNTY OF NEWCASTLE UPON TYNE

Transport and Electricity Undertaking

THE Transport and Electricity Committee invite tenders from manufacturers for the supply of sodium and colour corrected mercury vapour lighting lanterns complete with control gear.

Specifications and Forms of Tender can be obtained from the undersigned, and completed tenders must be delivered in the envelope provided not later than first post on 20 June, 1960.

The Committee does not bind itself to accept the lowest or any tender.

F. S. TAYLOR,
General Manager.

Head Office,
Manors,
Newcastle upon Tyne 1. (R 77)

N.A.T.O. UNCLASSIFIED

N.A.T.O. Common Infrastructure Slice VII

Naval Base Installations

FINAL Notice is hereby given that International Competitive Bids will be invited on or about 3 Aug., 1960, for the Supply and Installation of the complete electrical installation for a P.O.L. Storage Depot to be constructed at Rosneath, in the Dunbartonshire area of Scotland.

The system will be 415 volt, 3 phase, 4 wire, 50 cycles.

2. The approximate total value of the works is £10,000 and the contract will comprise flameproof and industrial equipment for the following purposes:—
   - Power distribution and control, including switchgear, cables and starters.
   - Lighting of roads, tankage areas, buildings and jetty.
   - Heating of buildings.
   - Cathodic protection of jetty.
   - Earthing and bonding.
3. The work will be carried out as one contract which will be undertaken as a subcontract within the framework of the main Contract for the construction of the depot.

   Bids for the Main Contract have been invited.
4. It should be noted that the importation of labour from sources outside the United Kingdom may be subject to restriction and that permission could, in any case, only be given on an undertaking that the Contractor would pay rates of wages and observe hours and conditions of labour not less favourable than those established for U.K. labour for the trade or industry in the same area.
5. The closing date for the receipt of bids will be 7 Sept., 1960.
6. Firms wishing to bid must formally notify their desire by application to the address below by 22 June, 1960.
7. Within one week of the closing date for the receipt of applications to bid firms wishing to be invited must forward the following information:
   - (i) Statement of financial resources and evidence of financial stability.
   - (ii) Details of recent major contracts completed for work of comparable

continued in next column

continued from previous column

   nature, including an indication of the value of each.
8. Enquiries regarding bidding should be addressed to:—

   Director General, Navyworks,
   Admiralty,
   Chamberlain Way,
   Pinner, Middlesex,
   England,

   quoting reference D.G.N.W./INFRA/8 ELECTRICAL SUB-CONTRACT. (R 48)

CORPORATION OF MANCHESTER

Housing Committee

TENDERS invited (returnable noon, 15 June, 1960) for electrical installations on the following schemes:

CONTRACT 222G: RIDGWAY ST, FIVE SHOPS AND MAISONNETTES.

CONTRACT 320: LEACH ST, GORTON, 16 DWELLINGS.

CONTRACT 324: KINGSGATE, WYTHENSHAWE, 81 FLATS.

CONTRACT 300: CHURNET ST, COLLYHURST, 27 DWELLINGS.

CONTRACT 326: MILES PLATTING, 193 DWELLINGS.

CONTRACT 295: HAWK GREEN, MARPLE, 133 DWELLINGS.

Tender forms and particulars from Director of Housing, Town Hall, Manchester. (R 96)

APPOINTMENTS VACANT

ELECTRICAL ENGINEERING ASSISTANTS

REQUIRED with experience in preparing specifications for new electrical installations in buildings. For those obtaining H.N.C.(Elec.), prospects of advancement in entry grade to maximum of £1,135 (under review, will probably become £1,250). Pension scheme. Staff restaurant. One Saturday only worked in five. Form from Chief Engineer (GS/ET/1318/6), County Hall, S.E.1. (R 35)

LONDON ELECTRICITY BOARD

ENGINEER (OPERATION AND MAINTENANCE) TRANSMISSION

APPLICATIONS are invited for the above position in the Operations Branch of the Chief Engineer's Department. The successful applicant will be based at Chelsea, but may be required to undertake duties anywhere within the Board's area.

Applicants should have had a sound technical education and possess the Higher National Certificate. They should be experienced in Load Flow and Short Circuit calculations.

The post is graded under Schedule B of the National Joint Board Agreement as Grade 8, and the commencing salary within Class AX/EX will be in the range £775 per annum to £1,010 per annum, inclusive of London Allowance.

Application form obtainable from Personnel Officer, 46, New Broad St, London E.C.2., to be returned completed within 14 days of the publication date of this notice. Please quote ref: PER/V/2877/T. (R 76)

THE NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:

Area Board Headquarters

Chief Engineer's Department, Carliol House

SENIOR DRAUGHTSMAN
SECTION LEADER

Applicants must be experienced draughtsmen and fully conversant with modern drawing office methods.

Salary: Schedule D, Grade 3, £1,055/£1,155. N.J.B. conditions of service.

FOURTH ASSISTANT ENGINEERS
TECHNICAL SECTION

for general technical duties. Applicants must possess H.N.C. in electrical engineering, or equivalent, and experience with H.V. Protection Equipment, Instruments, Electronics or Meters an advantage.

Salary: Schedule B, Grade 8, £735/£935. N.J.B. conditions of service.

Wear Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER
CROOK DISTRICT

Applicants must have had sound training and be experienced in construction, operation and maintenance of H.V., M.V. and L.V. overhead and underground distribution networks, substation plant and auxiliary equipment. Preference will be given to candidates with qualifications leading to corporate membership of IEE.

Salary: Schedule A, Class E, Grade 7, £860/£905. N.J.B. conditions of service.

Tees Sub-Area

THIRD ASSISTANT DISTRICT ENGINEERS WITH LOCATION AT DARLINGTON (TWO), HARTLEPOOLS (ONE) AND STOCKTON (ONE), RESPECTIVELY

Salaries: Schedule A, Class F, Grade 9, £815/£860. N.J.B. conditions of service.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box 117, Carliol Hse, Newcastle upon Tyne, within ten days of the appearance of this advertisement. (R 70)

THE EAST MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced persons for the following appointments in the Leicester Sub-Area. Applications should state age, qualifications, present position and salary, previous experience and quote the appropriate Vacancy Number.

Vacancy No. 67/60.

THIRD ASSISTANT DISTRICT ENGINEER
LEICESTER SUB-AREA

Salary: N.J.B. Class F, Grade 9, £815 x £15—£860 per annum.

Candidates should have practical experience in the construction, operation and maintenance of underground distribution systems up to and including 11 kV. Ability to drive a car is essential, and the successful candidate will be required to reside in Leicester, and to undertake standby duties.

Vacancy No. 68/60.

THIRD ASSISTANT DISTRICT ENGINEER
LOUGHBOROUGH DISTRICT
(KIBWORTH SECTION)

Salary: N.J.B. Class F, Grade 9, £815 x £15—£860 per annum.

Candidates should have practical experience in the construction, operation and maintenance of 11 kV and L.V. underground and overhead distribution systems. Ability to drive a car is essential, and the successful candidate will be required to reside in or near Kibworth, and to undertake standby duties.

Applications for the above vacancies should be addressed to The Manager, Leicester Sub-Area, Charles St, Leicester, to reach him within 14 days of the date of this advertisement. (R 64)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 40s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for box Number and postage on replies 2s.

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule B. Salary includes London Allowance.

FOURTH ASSISTANT ENGINEER
ELECTRICAL DEPARTMENT
DEVELOPMENT SECTION
DIVISIONAL HEADQUARTERS
GENERATION HOUSE
Vacancy No. 60/378.

Candidates should possess technical qualifications equivalent to corporate membership of the Institution of Electrical Engineers and should be conversant with methods of solving short circuit and power flow problems on high voltage transmission systems. Experience in the use of d.c. and a.c. analysers would be an advantage. Salary: Class AX/EX, Grade 7, £890/£1,115 per annum.

Applications, quoting vacancy number to (or on form from) Personnel Officer, Central Electricity Generating Board, London Division, P.O. Box 136, London W.1, by 13 June, 1960. (R 30)

CITY OF SALISBURY

Southern Rhodesia

VACANCY FOR ELECTRICAL ENGINEER (DISTRIBUTION)

SALARY SCALE: £1,025 x £102 10s—£1,332 10s x £76 17s 6d—£1,563 2s 6d x £51 5s—£1,768 2s 6d PER ANNUM.

APPLICATIONS are invited for the Fixed Establishment post of Electrical Engineer (Distribution) in the Salisbury Municipal Electricity Department, on the scale £1,025 x £102 10s—£1,332 10s x £76 17s 6d—£1,563 2s 6d x £51 5s—£1,768 2s 6d per annum. No allowances are payable.

Commencing salary is based on qualifications and experience, with a barrier at £1,563 2s 6d per annum, above which no engineer can rise without being a corporate member of the British Institution of Electrical Engineers, and £1,614 7s 6d per annum is the maximum entry point into the grade.

Candidates must be graduates of the British Institution of Electrical Engineers and/or hold an equivalent electrical engineering degree.

Experience in the design and planning of distribution networks and substations from L.T. 11 kV and up to and including 33 kV, the preparation of technical specifications and the compiling of investigatory reports on general distribution problems, together with general experience on mains and substation construction works on a large undertaking is essential.

The person appointed may be required to undertake stand-by duties on a roster of approximately one in five, for which payment at the rate of £5 5s per week of duty will be made.

The appointment will be subject to the City Council's Service and Leave Regulations. The successful candidate will be required to furnish to the Council a satisfactory medical certificate of fitness and to serve a probationary period of not less than six months, and if thereafter confirmed in his appointment, to join the Southern Rhodesia Local Authorities' Joint Pension and Widows' and Orphans' Fund. He must also be able to comply with the requirements of the Federal Immigration Authorities.

Candidates must submit full particulars of their qualifications, training and experience, giving details of positions held and salaries received. Age, place of birth, nationality and marital status should be stated and copies of not more than three recent testimonials may be forwarded.

Particulars of the undertaking and a summary of conditions of service, pension and leave entitlements, etc., may be obtained from Messrs Davis and Soper Ltd., 52-54 St. Mary Axe, London E.C.3, to whom applications must be submitted on or before 18 June, 1960. (R 22)

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the undernoted superannuable positions:

(1) SHIFT CHARGE ENGINEER
CLYDE'S MILL GENERATING STATION
(Ref. G16/60)

Applicants should have had considerable experience in the operation of modern turbine and boiler plant and, preferably, possess a Higher National Certificate in electrical or mechanical engineering.

Salary: N.J.B., Class K, Grade 7, £1,195/£1,270 (plus shift allowance of 10% per annum).

(2) PLANT SHIFT CONTROL ENGINEERS
KINCARDINE GENERATING STATION
(Ref. G17/60)

Applicants should have experience of Station Control Room duties in a modern power station and possess qualifications of Higher National Certificate standard or equivalent. The duties will include operation and supervision of all control equipment associated with main plant.

Salary: N.J.B., Class K, Grade 10, £965/£1,025, rising, ultimately, to Class M, Grade 10, £1,095/£1,170 (plus shift allowance of 10% per annum).

Housing accommodation may be made available if required.

Applications, on the standard form and quoting appropriate reference number, should be submitted to the Secretary, South of Scotland Electricity Board, Inverlair Ave, Glasgow S.4, not later than 17 June, 1960. (R 41)

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern and Yorkshire Region

FOURTH ASSISTANT ENGINEER
(PROTECTION)

APPLICATIONS are invited for appointment as Fourth Assistant Engineer in the Protection Section of the Technical Department, Yorkshire Division, with Headquarters at Rotherham.

Applicants should possess technical qualifications leading to corporate membership of the I.E.E. and have experience in the application or maintenance of control and protective equipments applied to high voltage transmission and generating systems.

The salary for the appointment will be in accordance with the National Joint Board Agreement, Schedule B, Grade 8 (£735/£960 per annum).

Forms of application may be obtained from the Assistant Regional Secretary (Personnel) Central Electricity Generating Board, North Eastern and Yorkshire Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 16 June, 1960. (R 34)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

North Staffordshire Sub-Area

SENIOR ASSISTANT ENGINEER
(CONSTRUCTION)
(HEADQUARTERS)

Applicants must have a comprehensive knowledge of the engineering problems associated with the distribution of electricity and the duties will include responsibility for the construction and maintenance of substations, underground mains and overhead lines up to 33 kV. Technical qualifications desirable. Salary: £1,600/£1,705 per annum (N.J.B. Grade L.4).

THIRD ASSISTANT DISTRICT ENGINEER
(STOKE SOUTH DISTRICT)

Duties include the construction, operation and maintenance of H.V. and L.V. Mains and Substations, and applicants should have had experience in the planning of system reinforcements and mains extensions. Technical qualifications desirable. Salary: £860/£905 per annum (N.J.B. Grade G.9).

Apply, by letter, within 14 days, stating age, experience, present position and salary to Mr C. C. Pimble, Sub-Area Manager, Midlands Electricity Board, 234 Victoria Rd, Fenton, Stoke-on-Trent.

F. W. CATER,
Secretary.
(R 42)

THE SOUTH WALES ELECTRICITY BOARD

ASSISTANT ENGINEER

APPLICATIONS are invited for the position of Assistant Engineer in the Port Talbot District in the Swansea and West Central Area of the Board.

The salary for the position will be in accordance with Class H, Grade 11 (£815/£860) of the National Joint Board Agreement for the Electricity Supply Industry.

Applications stating age, present position, present salary, qualifications and experience should be addressed to G. R. T. Edwards, B.SC., M.I.E.E., M.AM.I.E.E., Manager, Swansea and West Central Area, 29 Ystrad Rd, Swansea Industrial Estate, Swansea, Glam, so as to reach him not later than Thursday, 16 June, 1960.

Envelopes should be endorsed "Assistant Engineer—114/60."

R. G. WILLIAMS,
Secretary.
(R 47)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

GENERAL ASSISTANT ENGINEERS

REQUIRED at Ocker Hill Power Station for generation operational duties. N.J.B. service conditions, superannuable appointment, salary within Schedule A, G14, £610/£655 rising to £700 per annum.

Applicants should have received a sound technical training and preferably have had some industrial engineering experience, and have as a minimum qualification the Ordinary National Certificate.

Apply, quoting Vacancy Number 127/60MD on forms AE6 which are available from the Station Superintendent, Ocker Hill Power Station, Bayleys La, Ocker Hill, Tipton, Staffs, to whom they should be returned when completed not later than 17 June, 1960. (R 39)

MINISTRY OF WORKS

REQUIRES

Electrical Draughtsmen for Duty in London

APPLICANTS should be capable of designing Lighting and Power distribution for various types of building. A knowledge of control wiring, H.T. and substation design is also desirable.

Qualifications:

O.N.C. or equivalent standard.

Salary:

£570/£900 per annum—London (slightly less elsewhere), according to age and experience. Prospects of promotion to higher posts.

General Conditions:

Five-day week, 3¼ weeks' annual leave in addition to statutory holidays. Part-time day release for higher technical training in approved cases. Opportunities for non-contributory pensionable posts.

Applications:

to The Chief Engineer, Ministry of Works (A), Room 435, Abell Hse, John Islip St, London S.W.1. State age, experience, training and qualifications. Interviews at Regional Offices where possible. (R 26)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

YORKSHIRE ELECTRICITY BOARD

Head Office

COMMERCIAL DEPARTMENT
FOURTH ASSISTANT ENGINEER

APPLICATIONS are invited for the position of Fourth Assistant Engineer in the Development Section of the Commercial Department at the Board's Head Office.

Applicants must possess at least a Higher National Certificate in Electrical Engineering and have had some practical training and experience, by way of apprenticeship or otherwise.

Duties will include work on the general applications of electricity including particularly off-peak space heating; the interpretation of I.E.E. Wiring Regulations as they apply to general contracting; the collecting and collating of information on technical matters; interpretation and/or drawing up of specifications, safety rules, codes of practice, etc.; general correspondence on all these matters.

Salary: N.J.B. Schedule B, Class AX/EX, Grade 8, £735 x £25—£860 rising to £960 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Secretary, Yorkshire Electricity Board, Wetherby Rd, Scarcroft, nr. Leeds, not later than 17 June, 1960.

No. 6 (Hull) Sub-Area

GOOLE DISTRICT
SECOND ASSISTANT DISTRICT ENGINEER

Applicants should have had sound practical experience in the operation, maintenance, planning and construction of H.V. and L.V. underground and overhead lines and substations.

Candidates should have the Higher National Certificate in Electrical Engineering or possess equivalent qualifications.

The successful candidate will be required to undertake standby duty and to reside in Goole or near vicinity.

Salary: N.J.B. Class F, Grade 7, £910 x £15—£955 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Kingston upon Hull, not later than 17 June, 1960.

No. 7 (Grimsby) Sub-Area

GRIMSBY (LOUTH) DISTRICT
THIRD ASSISTANT DISTRICT ENGINEER

Applicants should be of Higher National Certificate standard in Electrical Engineering and have experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant and ancillary equipment.

Salary: N.J.B. Class H, Grade 9, £910 x £15—£955 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 17 June, 1960. (R 66)

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

DEPUTY STATION SUPERINTENDENT
NORTH WILFORD POWER STATION
Vacancy No. 121/60.

Applicants should be Corporate Members of the Institution of Mechanical and/or Institution of Electrical Engineers, and have experience in a responsible position with the operation and maintenance of modern large capacity high pressure plant employing pulverised fuel boilers.

The successful applicant should also possess sound administrative and organising ability.

The salary will be in accordance with Class K, Grade 2 (£1,725/£1,830 per annum) of the National Joint Board Agreement.

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Closing date for receipt of applications: 10 June, 1960.

SENIOR DRAUGHTSMAN
(CIVIL ENGINEERING AND BUILDING)
TRANSMISSION DEPARTMENT
DIVISIONAL HEADQUARTERS
Vacancy No. 124/60.

Applicants for this appointment should have suitable technical training and be thoroughly conversant with the design and detailing for civil and building works, including steel and R.C. structures and foundations. The work is associated with H.V. substations and generating stations.

Salary will be in accordance with Grade 4 of Schedule D of the National Joint Board Agreement and will be within the range £930/£1,030 per annum.

Closing date for receipt of applications: 10 June, 1960.

GENERAL ASSISTANT ENGINEER
(CHEMISTS)
WILLINGTON, CASTLE DONINGTON, SPONDON AND LEICESTER POWER STATIONS
Vacancy No. 127/60.

Candidates must have had a sound technical training and previous laboratory experience and should preferably hold the Higher National Certificate in Chemistry, but consideration will be given to candidates studying for that qualification.

The salary will be in accordance with Schedule A of the National Joint Board Agreement and will be within the range £560/£700 per annum.

Candidates should state on their application if they have preference for any of the stations.

Closing date for receipt of applications: 10 June, 1960.

ASSISTANT SHIFT CHARGE ENGINEER
DRAKELOW "B" POWER STATION
Vacancy No. 130/60.

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate, or its equivalent.

Salary will be in accordance with Class L, Grade 8 (£1,195/£1,270 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 10 June, 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated.

O. S. WOODS,
Divisional Controller.
(R 60)

LONDON ELECTRICITY BOARD

DISTRICT SENIOR COMMERCIAL ASSISTANT

APPLICATIONS are invited for the above position in the Board's Kent Suburban District. The successful candidate will be based at 9 Pier Rd, Erith, Kent, but will be required to work anywhere in the District and may, in emergency, be called upon to undertake duties in the Showrooms.

Applicants should be competent to control representatives engaged on matters connected with supply, tariffs, apparatus, and sales to consumers with domestic or small commercial or industrial installations. The possession of the E.D.A. Salesmanship Diploma would be considered an advantage.

The post is graded within the National Joint Council Agreement (Administrative and Clerical Grades) as Grade 4, i.e., £795 p.a. to £870 p.a. plus the appropriate London Area Allowance.

Application form obtainable from the Personnel Officer, 46 New Broad St, E.C.2. Please quote ref. PER/V/2924/T. (R 36)

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

ASSISTANT MAINTENANCE ENGINEER
(MECHANICAL)
HIGH MARNHAM POWER STATION
Vacancy No. 133/60.

APPLICATIONS are invited for the position of Assistant Maintenance Engineer (Mechanical) at High Marnham Power Station, near Newark, Notts.

Applicants should possess qualifications in Mechanical Engineering and have had some experience with the maintenance of modern power station plant.

The salary will be in accordance with Class M, Grade 8 (£1,270/£1,360 per annum), of the National Joint Board Agreement.

Closing date for receipt of applications: 17 June, 1960.

GENERAL ASSISTANT ENGINEERS
CASTLE DONINGTON POWER STATION
Vacancy No. 134/60.

Applications are invited for the positions of General Assistant Engineers at Castle Donington Power Station, near Derby.

Facilities are available whereby experience can be obtained in all sections of a large modern power station, and the prospects of advancement are real to those who are willing to take advantage of the opportunities.

The salary during the initial training period will depend upon qualifications and knowledge, and will be within the range (£560/£700 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 17 June, 1960.

FOURTH ASSISTANT ENGINEER
COVENTRY SECTION
Vacancy No. 135/60.

Applications are invited for the position of Fourth Assistant Engineer at Coventry Transmission Section, Victoria Mills, Bulkington, near Nuneaton.

Applicants should have experience of maintenance and operation of E.H.T. overhead lines, transformers and switchgear.

Preference will be given to candidates with qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

The salary will be in accordance with Class AX/EX, Grade 8 (£735/£960 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 17 June, 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Station Superintendent or Section Engineer concerned, and should be returned to the Station or Section Office by the date stated.

O. S. WOODS,
Divisional Controller.
26 May, 1960. (R 63)

ADMIRALTY

TRAINEE ELECTRICAL AND MECHANICAL ENGINEERING DRAUGHTSMEN

REQUIRED for unestablished appointments in Bath. Candidates must be British subjects aged 21 and upwards and have been apprenticed or had equivalent workshop experience in either electrical or mechanical engineering in factories or shipyards. Free training in drawing and electrical and mechanical engineering technology for four months beginning October, 1960, at Bath Technical College. Salary during training £550 (age 21) to £730 according to age and experience, increased (except at age 21) on satisfactory completion of training. Five-day week. Eighteen days annual leave. Substantial grants towards travelling expenses for all candidates called for interview. Apply giving details of age, technical qualifications, apprenticeship (or equivalent) and experience to Director, General Ships, Admiralty Offices, Foxhill, Bath. (R 44)

CENTRAL ELECTRICITY GENERATING BOARD
Midlands Division

SHIFT CHARGE ENGINEER

REQUIRED at Nechells "A" and "B" Power Stations, Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K7, £1,195/£1,270 per annum, plus 10% Shift Allowance.

A sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear in a large modern power station are required. Appropriate qualifications an advantage.

Apply, quoting Vacancy No. 130/60MD on forms AE6, which are available from Station Superintendent, Nechells Power Station, off Aston Church Rd, Nechells, Birmingham 7, to whom they should be returned when completed not later than 13 June, 1960. (R 59)

CENTRAL ELECTRICITY GENERATING BOARD
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

GENERAL ASSISTANT ENGINEERS
TECHNICAL DEPARTMENT
Vacancy No. 138/60.

Duties will include assisting with laboratory and field tests in connection with all sections of the Technical Department.

Preference will be given to applicants who hold, or are studying for, the Higher National Certificate (Electrical Engineering).

The successful candidates will be expected to reside in or near Loughborough, Leicestershire.

The salary will be in accordance with Class AX/EX, Grade 9 (£570/£725 per annum) of Schedule B of the National Joint Board Agreement.

Closing date for receipt of applications: 17 June, 1960.

FOURTH ASSISTANT ENGINEER
TECHNICAL DEPARTMENT
SOUTHERN DISTRICT OFFICE
LEICESTER POWER STATION
Vacancy No. 139/60.

The minimum technical qualification desired is the Higher National Certificate in Electrical Engineering and preference will be given to candidates who have completed a recognised post graduate apprenticeship.

Experience of high-voltage switchgear and protective gear will be an advantage.

The successful candidate will be expected to reside in or near Leicester.

The salary will be in accordance with Class AX/EX, Grade 7 (£840/£1,065 per annum) of Schedule B of the National Joint Board Agreement.

Closing date for receipt of applications: 17 June, 1960.

FOURTH ASSISTANT ENGINEER
TECHNICAL DEPARTMENT
DIVISIONAL HEADQUARTERS
Vacancy No. 140/60.

The minimum technical qualification desired is the Higher National Certificate in Electrical Engineering and preference will be given to candidates who have completed a recognised post graduate apprenticeship.

Experience of high-voltage switchgear and protective gear will be an advantage.

The salary will be in accordance with Class AX/EX, Grade 8 (£735/£960 per annum) of Schedule B of the National Joint Board Agreement.

Closing date for receipt of applications: 17 June, 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated.

O. S. WOODS,
Divisional Controller

27 May, 1960. (R 62)

LONDON ELECTRICITY BOARD

SENIOR SALES REPRESENTATIVE

APPLICATIONS are invited for the above position in the Commercial Department of the Board's Surrey Suburban District. The successful applicant will be based at Electricity Hse, Durnsford Rd, Wimbledon, but will be required to work anywhere in the District, and may, from time to time, be called upon to undertake duties in the Showroom.

Applicants should have good sales ability and be thoroughly conversant with supply matters, tariffs, apparatus and sales to consumers with domestic or small commercial or industrial installations. The possession of the E.D.A. Salesmanship Certificate would be considered an advantage. They should be competent to lead a small team of representatives.

The post is graded within the National Joint Council Agreement (Administrative and Clerical Grades) as Grade 3, i.e., £720/£780 per annum, plus the appropriate London Area Allowance.

Application form obtainable from the Personnel Officer, 46 New Broad St, E.C.2. Please quote ref. PER/V/2906/T. (R 37)

LONDON COUNTY COUNCIL

HACKNEY TECHNICAL COLLEGE
DALSTON LA, E.8

REQUIRE, Sept., 1960, suitably qualified evening Teacher for Electrical Installation—Rules and Workshop (first and second years)—City and Guilds.

Applications (no forms) to Secretary, stating age, qualifications, industrial experience, teaching experience (if any), and evenings available from 7 to 9.15 p.m.

Rate of pay: 2¼ hours, 46s 3d (1369.)

(R 33)

CENTRAL ELECTRICITY GENERATING BOARD
East Midlands Division

PLANT CONTROL ENGINEER
CASTLE DONINGTON POWER STATION
Vacancy No. 141/60.

APPLICATIONS are invited for the position of Plant Control Engineer at Castle Donington Power Station, near Derby.

Candidates should have had operating experience on large modern pulverised fuel-fired boilers and associated turbines.

The possession of the Ordinary National Certificate, or the pursuit of studies leading thereto, will be an advantage.

Salary will be in accordance with Class L, Grade 10 (£1,025/£1,085 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 17 June, 1960.

GENERAL ASSISTANT ENGINEER
LEICESTER POWER STATION
Vacancy No. 142/60.

Applications are invited for the position of General Assistant Engineer at Leicester Power Station, Rawdykes Rd, Leicester.

Facilities are available whereby experience can be obtained in all sections of a large modern power station, and the prospects of advancement are real to those who are willing to take advantage of the opportunities.

The salary during the initial training period will depend upon qualifications and knowledge, and will be within the range (£560/£700 per anum) of the National Joint Board Agreement.

Closing date for receipt of applications: 17 June, 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Station Superintendent concerned, and should be returned to the Station by the date stated.

O. S. WOODS,
Divisional Controller.

27 May, 1960. (R 61)

CENTRAL ELECTRICITY GENERATING BOARD
London Division

APPLICATIONS invited for following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule B. Salary includes London Allowance.

THIRD ASSISTANT ENGINEER
OPERATIONAL RESEARCH DEPARTMENT
DIVISIONAL HEADQUARTERS
GENERATION HOUSE
Vacancy No. 60/377.

Ambitious young engineers who would like experience in assisting in the solution of management problems and a chance to view the workings of the industry in broad perspective, prior to moving to higher posts.

Essential qualifications are that candidates should have:

(a) A minimum academic qualification of H.N.C.

(b) A flair for investigation.

(c) Flexible questioning minds.

(d) An ability to approach people at all levels with tact and patience.

Some knowledge of statistics and method study would be useful but are not essential since training will be given. Salary: Class AX/EX, Grade 6, £975/£1,220 per annum.

Applications, quoting vacancy number to (or on form from) Personnel Officer, Central Electricity Generating Board, London Division, P.O. Box 136, London W.1, by 13 June, 1960. (R 31)

MINISTRY OF LABOUR

H.M. ELECTRICAL INSPECTOR OF FACTORIES

PENSIONABLE post at Manchester for man or woman at least 35 on 1 April, 1960, with corporate membership of I.E.E. and several years' professional experience. Candidates should preferably hold a university degree in electrical engineering. Responsible experience in electrical supply, electrical manufacturing works or large industrial electrical installation an advantage. Salary scale (men) £1,550 (lower if under 40) to £2,070. Exceptionally starting pay may be above minimum. Promotion prospects. Write Civil Service Commission, 17 North Audley St, London W.1. for application form quoting S/5138/60. Closing date 7 July, 1960. (R 43)

AIR MINISTRY

REQUIRE ASSISTANT MECHANICAL and ELECTRICAL ENGINEERS for design, construction and maintenance of installations on airfields, radar stations, missile bases, workshops and maintenance units for R.A.F. at home and overseas as well as certain Civil Airports. Salary: £805 at 25 to £1,095 at 34 or over, thereafter rising to max. £1,260 with increase for London and slight decrease for country districts. Appointments non-pensionable but long term. Promotion prospects. Five-day week with four weeks two days leave a year initially. Special allowance in addition to salary during overseas service. Quals. and experience:

(i) (a) University degree or equiv. diploma in electrical and/or mechanical engineering with at least two years' apprenticeship;

or (b) Graduate or corporate member of I.E.E. with at least three years' apprenticeship;

or (c) Graduate or corporate member of I.Mech.E. appreciable electrical engineering experience with at least three years' apprenticeship;

and (ii) Have been employed for minimum of two years with well established engineering concern and gained wide experience in both electrical and mechanical engineering practice.

Applicants must be natural born British subjects between ages of 25 and 45. Forms from Ministry of Labour, Technical and Scientific Register (K), 26 King St, London S.W.1, quoting D.158/OA. (R 21)

LONDON ELECTRICITY BOARD

ENGINEER (CONSTRUCTION)

APPLICATIONS are invited for the above position in the Construction Branch of the Chief Engineer's Department at Lesco Hse, Stamford St, S.E.1.

The successful candidate will be required to assist in supervising the installation of electrical plant, including transformers, switchgear and cables at working pressures up to 66 kV, together with all auxiliary equipment.

Previous experience in this work would be an advantage. Applicants should possess the Higher National Certificate in Electrical Engineering.

The post is graded under Schedule B of the National Joint Board Agreement as Grade 8 and the commencing salary within Class AX/EX will be in the range of £775 per annum to £1,010 per annum, inclusive of London Allowance.

Application form, obtainable from the Personnel Officer, 46 New Broad St, E.C.2, to be returned completed within 14 days of the publication date of this notice. Please quote: ref.: PER/V/2975/T. (R 69)

South Western ELECTRICITY

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following positions:

SECOND ASSISTANT ENGINEER
(PLANNING AND DEVELOPMENT)
BRISTOL GROUP

Salary within Class L, Grade 8, £1,195 x £25—£1,270 per annum of the N.J.B. Agreement.

The successful candidate will be required to undertake the planning and preparation of schemes, estimates and reports for immediate and long-term extension and reinforcement of underground and overhead distribution systems up to and including 33 kV. This work will include preparation of specifications for plant and equipment; load flow and system fault level calculations, estimates of load growth and future reinforcement trends, and technical and economic assessment of District capital sanctions.

Considerable experience of planning, construction and operation of distribution systems up to 33 kV, underground and overhead, together with a sound knowledge of all types of plant and equipment is essential.

Corporate membership of the Institution of Electrical Engineers or the possession of equivalent qualifications is also necessary.

Applications for the above post to be made on Standard Form AE6/ACT, obtainable by postcard only, from the Group Administrative Officer, South Western Electricity Board, Electricity Hse, Colston Ave, Bristol 1. Closing date for receipt of completed applications is 18 June, 1960.

THIRD ASSISTANT DISTRICT ENGINEER
(PLANNING) WESTON

Salary within Class G, Grade 9, £860 x £15—£905 per annum, of Schedule A of the N.J.B. Agreement.

The successful candidate will be required to assist generally in the planning and technical work relating to construction of substation equipment up to and including 33 kV and also for both overhead and underground systems. The person appointed may be required to undertake standby duty and he will be appointed a Senior Authorised person.

Possession of appropriate technical qualifications at least equivalent to the Higher National Certificate in Electrical Engineering is necessary and a current driving licence is desirable.

Applications for the above post to be made on Standard Form AE6/ACT, obtainable by postcard only, from the District Manager, South Western Electricity Board, 168 Locking Rd, Weston-super-Mare, Somerset. Closing date for receipt of completed applications is 18 June, 1960. (R 71)

ASSISTANT ELECTRICAL ENGINEER

REQUIRED for the County Architect's Office at Wakefield. Salary range:

SPECIAL GRADE: £785/£1070, or
APT. III: £880/£1,065, or
APT. II: £765/£880

according to qualifications and experience.

Applicants should be capable draughtsmen with good experience in the preparation of schemes, specifications and estimates for all classes of electrical work.

Applications stating age, qualifications, experience, present position and giving names and addresses of two referees, to be sent to the undersigned not later than Tuesday, 21 June, 1960.

A. W. GLOVER, F.R.I.B.A.,
County Architect.

Bishopgarth,
Westfield Rd,
Wakefield. (R 32)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

ENGINEERING DRAUGHTSMAN

REQUIRED in the Electrical Engineers' Drawing Office at Divisional Headquarters, Birmingham.

Applicants should have suitable technical training and be capable, under supervision, of preparing detail drawings in connection with the construction of High Voltage Substations.

Salary will be in accordance with Grade 6 of Schedule D of the National Joint Board Agreement, within the range £620/£740 per annum.

Applications quoting Vacancy Number 125/60MD, should be submitted on the official form AE6, which may be obtained from the Establishments Officer, Central Electricity Generating Board, Midlands Division, 53 Wake Green Rd, Moseley, Birmingham 13.

Closing date for receipt of applications 13 June, 1960. (R 40)

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER
SUTTON DISTRICT

SALARY £860 x £15—£905 p.a. under N.J.B., Class G, Grade 9, plus London Allowance. Superannuable. Applicants should have had a good general education, be technically trained up to Higher National Certificate standard and must have had practical experience in general distribution work on H.V. and L.V. systems. Ability to plan and prepare schemes for mains extensions would be an advantage. Applications quoting ET and naming two referees, on forms from District Manager, Seeboard, 52 High St, Sutton, Surrey, by 15 June, 1960.

ASSISTANT DISTRICT ENGINEER
SUTTON DISTRICT

Salary £765 x £15—£810 p.a. plus London Allowance under N.J.B., Class G, Grade 11. Superannuable. Applicants should possess the Higher National Certificate in electrical engineering and have had a thorough training in underground and overhead distribution systems. Applications, quoting ET and naming two referees, on forms from District Manager, Seeboard, 52 High St, Sutton, Surrey, by 15 June, 1960.

ASSISTANT DISTRICT ENGINEER
WOKING DISTRICT

Salary £815 x £15—£860 per annum, N.J.B. Class F, Grade 9. Superannuable. Applicants of good general education should have had technical training to H.N. standard with practical experience of general distribution work and be capable of giving assistance on planning, construction or maintenance work. Applications quoting ET and naming two referees on forms from District Manager, Seeboard, 4 Chobham Rd, Woking, by 15 June, 1960.

GEORGE WRAY,
Secretary.
(R 58)

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

ASSISTANT ENGINEER (INSTRUMENTS)
EARLEY GENERATING STATION, READING
SEC/3.81/T.

APPLICANTS should have previous experience of modern generating station plant, a good knowledge of the instruments and other measuring apparatus used and have had a sound technical training. Preference will be given to those possessing qualifications leading to corporate membership of an appropriate professional institution or equivalent qualifications.

Salary: N.J.B., G.10, £815/£860.

GRADE 10 ENGINEER
EARLEY GENERATING STATION, READING
SEC/3.80/T.

Applicants should have had operating experience in a modern generating station. Manufacturing works experience would be an advantage.

Salary: N.J.B., G.10, £815/£860.

Special application forms obtainable only from Divisional Secretary, 111 High St, Portsmouth, should be returned by 14 June, 1960. Please quote reference number. (R 68)

THE NORTH WESTERN ELECTRICITY BOARD

SENIOR DRAUGHTSMAN (ELECTRICAL)
DESIGN SECTION
SUB-AREA ENGINEERING DEPARTMENT
MANCHESTER

APPLICANTS should have had good technical training and drawing office experience in the electrical design, layout and detailing of indoor and outdoor substations up to and including 33,000 volts. Experience in the preparation of protective system schematic and wiring diagrams would be an advantage.

Salary scale: £790 x £20—£890 p.a., Schedule D, Grade 5. N.J.B. Conditions.

Applications must be made on a form to be obtained from the Manager (Staff Vacancy), No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, and returned to him by 13 June, 1960.

SENIOR ASSISTANT ENGINEER
(DOMESTIC SALES)
SUB-AREA COMMERCIAL DEPARTMENT
OLDHAM

Duties will include the supervision of all aspects of domestic load development, including publicity, management of Service Centres and the sale, installation and maintenance of appliances.

Preference will be given to applicants who are Corporate Members of the Institution of Electrical Engineers.

Salary scale: £1,600/£1,705 p.a., Grade L.4. N.J.B. Conditions.

SECOND ASSISTANT ENGINEER
(POWER SALES)
SUB-AREA COMMERCIAL DEPARTMENT
OLDHAM

Applicants preferably should have experience in the application of electricity to cotton spinning, textile machinery manufacture, general engineering and chemical industries, and be familiar with electricity tariffs.

Corporate membership of the Institution of Electrical Engineers would be an advantage.

Salary scale: £1,270 x £30—£1,360 p.a., Grade L.7. N.J.B. Conditions.

THIRD ASSISTANT ENGINEER
(CIVIL ENGINEERING)
SUB-AREA ENGINEERING DEPARTMENT
OLDHAM

Applicants should be suitably qualified and have had experience in preparing sketch schemes, working drawings and specifications for commercial buildings, including Service Centres and supervision of work on site.

Salary scale: £1,025/£1,085 p.a., Grade L.10. N.J.B. Conditions.

Applications must be made on a form to be obtained from the Manager, No. 3 Sub-Area, The North Western Electricity Board, Union St, Oldham, and returned to him so as to be received not later than 18 June, 1960. (R 65)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

VACANCY No. 126/60.

GENERAL ASSISTANT ENGINEER (CHEMIST)

CROYDON "A" AND "B" GENERATING STATIONS

APPLICANTS should have had experience in the analysis of coal, water and oil and should preferably hold O.N.C. (Chemistry).

Salary: N.J.B., Class K, Grade 18, £600/£645 per annum, including London Allowance.

Applications, giving age, details of qualifications, experience, etc., to Station Superintendent, Croydon "B" Generating Station, Beddington Farm La, Croydon, Surrey, to arrive by 17 June, 1960.

W. H. DUNKLEY,
Divisional Controller.
(R 75)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Northmet Sub-Area

BARNET DISTRICT
134/60.N.

DISTRICT COMMERCIAL ASSISTANT
(REF. 965)

Candidates should be fully experienced in modern installation practice, able to prepare specifications and competitive quotations and be competent to design thermal storage heating schemes, particularly floor-warming. Sound knowledge of the tariffs and their application, including supply by special agreement is necessary.

Salary: N.J.C., Grade 3, £720/£780, plus London Allowance.

Apply by letter to F. G. Bromley, B.SC. (HONS.) ENG., M.B.I.M., M.I.E.E., Manager, Eastern Electricity Board, 7c High St, Barnet, Herts, by 15 June, 1960.

ENFIELD DISTRICT
137/60.R.

FOURTH ASSISTANT ENGINEER
(REF. 972)

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems, including substations.

Salary: N.J.B., Class G, Grade 11, £765/£810, plus London Allowance.

Apply by letter to A. T. Durbridge, Manager, Eastern Electricity Board, 40 Church St, Enfield, by 15 June, 1960.

ST. ALBANS DISTRICT
135/60.R.

THIRD ASSISTANT ENGINEER
(REF. 975)

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems, including substations.

Salary: N.J.B., Class G, Grade 9, £860/£905.

Apply by letter to F. J. Drake, ASSOCIATE I.E.E., Manager, Eastern Electricity Board, 107 St. Peter's St, St. Albans, by 13 June, 1960.

Suffolk Sub-Area

NORTH EAST SUFFOLK DISTRICT
136/60.R.

SECOND ASSISTANT ENGINEER

Candidates should have had a sound technical training and considerable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground systems (including substations) at voltages up to and including 33 kV.

Salary: N.J.B., Class F, Grade 7, £910/£955.

The successful candidate will be required to reside within reasonable proximity of Beccles.

Apply by letter to J. H. Shepherd, A.M.I.E.E., Manager, North-East Suffolk

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District, Eastern Electricity Board, The Grove, Ingate, Beccles, Suffolk, by 13 June, 1960.

Fens Sub-Area

127/60.N.

THIRD ASSISTANT ENGINEERS
(OPERATIONS AND MAINTENANCE)

Vacancies exist for two third assistant engineers in the Sub-Area, one based at Cambridge and one at Peterborough. The duties include the organisation of routine inspection and maintenance of all lines, plant and equipment in the two regions of the Sub-Area, and applicants should have had experience in this field. Technical education to Grad. I.E.E. standard would be an advantage.

Salary: N.J.B., Class K, Grade 10, £965/£1,025.

GENERAL ASSISTANT ENGINEER
126/60.N.

A vacancy exists for an engineer of good technical education in the Construction (Preparation) Section of the Sub-Area Engineer's Department. The duties include the survey and preparation of line schedules for 33 kV and 11 kV lines throughout the Sub-Area, and the position offers a good opportunity to gain experience in this field.

Salary: N.J.B., Class K, Grade 15, £710/£755.

For these appointments apply by letter to the Secretarial Officer, Eastern Electricity Board, Fens Sub-Area, Milton Hall, Milton, Cambridge, by 10 June, 1960. (R 67)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Lanarkshire Area

THIRD ASSISTANT COMMERCIAL ENGINEER

APPLICATIONS are invited for the appointment of Third Assistant Commercial Engineer in charge of the Board's Central Repair Workshop at Leven St, Motherwell.

Applicants should have served an apprenticeship with subsequent practical experience in the repair and maintenance of all types of domestic electrical appliances and have experience in the control of staff. Possession of a National Certificate in electrical engineering or equivalent qualification would be advantageous.

The appointment is superannuable and the conditions of employment will be in accordance with the National Joint Board Agreement, Schedule A, and the salary in accordance with Class L, Grade 10, £1,025/£1,085 per annum.

The successful candidate will require to reside within a reasonable distance of the Board's premises at Motherwell.

Application forms which may be obtained from the undersigned should be forwarded to this office within 14 days of the date of this advertisement.

R. J. RENNIE,
Manager.

Montrose Cres,
Hamilton. (R 72)

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

GENERAL ASSISTANT ENGINEER

REQUIRED at Portishead "B" Power Station.

Superannuation scheme. Salary: N.J.B., Class K, Grade 15, £710/£755 per annum.

Preference will be given to candidates who hold or are at present studying for a Higher National Certificate or similar qualifications.

Closing date: 14 June, 1960. Please quote Ref. ET/AV/64/60.

ASSISTANT SHIFT CHARGE ENGINEER

required at East Yelland Power Station, North Devon.

Superannuation scheme. Salary: N.J.B., Class H, Grade 9, £910/£955 per annum, plus 10% for shift duties.

Applicants should possess good technical qualifications and should have had training and experience in the control and operation of modern steam generating plant and main switchgear.

Closing date: 14 June, 1960. Please quote Ref. ET/AV/65/60.

continued in next column

continued from previous column

ASSISTANT SHIFT CHARGE ENGINEER

required at Newton Abbot Power Station.

Superannuation scheme. Salary: N.J.B., Class F, Grade 9, £815/£860 per annum, plus £90 p.a. for shift duties.

Applicants should possess good technical qualifications and should have had training and experience in the control and operation of modern steam generating plant and main switchgear.

Closing date: 13 June, 1960. Please quote Ref. ET/AV/72/60.

Applications on Form A.E.6/ACT obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by the date stated. (R 74)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

APPLICATIONS are invited for the following superannuable N.J.B. appointments in the South Wales Division:

ASSISTANT SHIFT CHARGE ENGINEER
USKMOUTH "A" POWER STATION
NEWPORT, MON.

VACANCY No. 143/ET/60.

Salary: K.8, £1,095/£1,170 per annum, plus 10% shift enhancement.

Experience in a modern power station essential. Appropriate engineering qualifications and a regular apprenticeship desirable.

ASSISTANT SHIFT CHARGE ENGINEER
ROGERSTONE POWER STATION, MON.

VACANCY No. 144/ET/60.

Salary: G.8, £910/£955 per annum, plus 10% shift enhancement.

Applicants should possess appropriate engineering qualifications and have had experience in a modern power station.

MAINTENANCE ENGINEER (PLANNING)
TIR JOHN POWER STATION, SWANSEA

VACANCY No. 145/ET/60.
(REVISED ADVERTISEMENT)

Salary: H.7, £1,025/£1,085 per annum.

Applicants should possess H.N.C. or equivalent qualifications and have had experience in a modern power station. The successful applicant will be responsible to the Deputy Station Superintendent for the planning of all overhaul and preventive maintenance. The appointment offers ample scope for initiative and experience to the right person.

Previous applicants need not re-apply.

Special application forms obtainable from Secretary, South Wales Divison, Central Electricity Generating Board, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 17 June, 1960. (R 73)

ASSISTANT ELECTRICAL ENGINEER required by national newspaper. Age 25/26. Electrical apprenticeship and Higher National. Must be first-class electrical draughtsman. Good prospects.—Box No. 7879, Electrical Times. (R 83)

ELECTRICAL CONTRACTORS HAVE THE FOLLOWING VACANCIES IN THEIR MANCHESTER OFFICE:

(a) **SENIOR DESIGN ENGINEER** capable of working without supervision and having a wide experience in the design of lighting and power installations, control and instrumentation cabling on large industrial and commercial projects.

(b) **ESTIMATING ENGINEERS** of proved ability in the preparation of detailed estimates for all classes of installation and cabling work, both in this country and overseas.

Application in own handwriting, state age, educational background, qualifications, experience and salary required, to the MANAGER:

DRAKE & GORHAM (CONTRACTORS) LTD.
21 NEWTON ST., MANCHESTER 1

(R 82)

ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL

has vacancies for

ELECTRICAL TECHNICIANS

POST A: To be responsible to a Senior Officer for the day-to-day ELECTRONIC, ELECTRICAL and INSTRUMENTATION MAINTENANCE of reactor equipment in a high flux reactor.

SALARY: £1,105/£1,340 p.a.

POST B: To be in charge of the MAINTENANCE of a medium flux reactor.

SALARY: £925 (at age 30)/£1,105 p.a

Applicants should have served a recognised engineering apprenticeship or have had equivalent training which for POST A should have been in the electrical engineering field.

An appropriate National Certificate or equivalent an advantage for POST B and desirable for POST A.

EXPERIENCE REQUIRED: For POST A experience of instrumentation and light current electrical equipment.

For POST B experience of maintenance of electronic, light electrical and electro-mechanical equipment is desirable.

Housing and contributory pension scheme.

Send **POST CARD** for details to Senior Recruitment Officer, (1688/49), U.K.A.E.A., A.E.R.E., Harwell, Didcot, Berks. (R 38)

WOULD YOU LIKE TO WORK IN A PEACEFUL ATMOSPHERE WITH BEAUTIFUL COUNTRY AROUND YOU?

GROUP OF ENGINEERING COMPANIES WITH MODERN OFFICES IN HEREFORD REQUIRE:

(1) **TECHNICAL AND COMMERCIAL SALES MANAGER with experience of industrial air conditioning and refrigeration for home and export.**

(2) **DEVELOPMENT ENGINEER.**

(3) **SALES ENGINEERS.**

(4) **REFRIGERATION, MECHANICAL AND HYDRAULIC DRAUGHTSMEN AND ESTIMATORS.**

Five-day week. Contributory pension scheme. Applications, which will be treated in strict confidence, should be made in writing stating age, experience, salary required, etc., to Managing Director, Denco Works, Hereford.

(R 20)

PERMACEL TAPES LIMITED

require

PRODUCT MANAGER

for the Development and Promotion of Pressure Sensitive Electrical Tapes

The successful applicant should be between the age of 30 and 40 years and have a sound basic knowledge of electrical engineering and experience in advertising and marketing to the Industry. Experience in the Pressure Sensitive Tape field would be a great advantage but not essential.

Progressive Position
Four-figure salary (plus expenses)
Pension Scheme (plus other benefits)

Full details of age, experience and qualifications to the Marketing Manager, Permacel Tapes Limited, 260 Bath Road, Slough, Bucks.

A Johnson & Johnson Company

(R 45)

DOWDING & MILLS LTD.
Bordesley, Birmingham 12

The Industrial Electrical and Mechanical Repair Specialists seek the services of an

ENGINEER REPRESENTATIVE

to operate from their new branch at Southampton

Experience of electric motor manufacture and repair desirable, together with a knowledge of metal spraying.

Basic Salary, Bonus, Superannuation Scheme and Company car provided

Applications to the:

Southern Area Sales Manager, DOWDING & MILLS LTD., 24/26 White Post Lane, LONDON E.9

(R 54)

APPLICATIONS are invited for posts of ASSISTANT WORKS ENGINEER, ASSISTANT PRODUCTION SUPERINTENDENT, TECHNICAL OFFICER, WORKS CHEMIST, TEST ENGINEER, ASSISTANT PLANNING SUPERINTENDENT in Rubber and Plastic Cable Factory being erected at Poona, near Bombay.

Remuneration commensurate with age, experience, qualifications, and ability of selected candidates.

Closing date for applications: 13 June, 1960.

Apply Box No. 7887, Electrical Times. (R 87)

BRITISH ENGINE BOILER AND ELECTRICAL INSURANCE CO. LTD., Longridge Hse, Manchester 4. ELECTRICAL SURVEYORS required in Ireland and Scotland. Permanent positions carrying progressive salary scale £800/£1,100 and non-contributory pension. Candidates aged 26 to 32, with H.N.C. in electrical engineering or Grad. I.E.E. and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. (R 80)

CROMPTON PARKINSON LTD. require a SENIOR TRANSFORMER DESIGNER for their Hayes (Middx) Works. Applicants should have Degree or H.N.C. and preferably some years' experience with Transformers up to 20,000 kVA and 66 kV, with on load lap changing gear. Write with full particulars of age, education, qualifications and salary required to the Personnel Officer, Clayton Rd, Hayes, Middx. (R 52)

TESTERS
(ELECTRONICS)

Vacancies now exist for men with practical experience on electronic test work on equipment similar to Data Processing Equipment. Qualifications up to approximately O.N.C. are desirable.

HOUSING FOR RENTAL MAY BE MADE AVAILABLE.

Please apply with full details to the Personnel Officer, A.E.I. Instrumentation Division, P.O. Box 1, Harlow, Essex. (R 51)

THE GENERAL ELECTRIC COMPANY LIMITED

OPERATIONS ENGINEERS

Senior staff experienced in modern power plant are required for turbine operation and maintenance services at home and abroad.

We are looking for qualified engineers with an analytical approach who are capable of independent decisions on problems concerned with the running of power plant of any capacity.

These positions offer opportunity for men who wish to progress by their own efforts.

Please apply in writing, giving full details, to PERSONNEL MANAGER (JVG), THE GENERAL ELECTRIC COMPANY LIMITED, ERITH, KENT.

(R 23)

PERMACEL TAPES LIMITED

require a

SALES ENGINEER

for Pressure Sensitive Electrical Tapes and Associated Products

Applicants should have a sound basic knowledge of electrical engineering and experience in selling to this Industry. The area is Northern England and Scotland and residence in the Manchester, Liverpool or West Riding area is necessary.

Excellent scope and prospects to a man with real sales ability, drive and energy.
A generous salary and expense allowance is offered.
Car provided.
Pension Scheme and other benefits.

Applicants should write, giving full details of age, experience and qualifications, to the Home Sales Manager, Permacel Tapes Limited, 260 Bath Road, Slough, Bucks.

A Johnson & Johnson Company

(R 46)

HOSPITAL DESIGN ENGINEERS

EXPANSION OF BUILDING PROGRAMME

NORTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD

PROFESSIONAL ENGINEERS required for the staff of the Regional Engineer, James Galloway, M.I.MECH.E., M.I.E.E., M.I.H.V.E.

The posts are permanent and pensionable and offer considerable career prospects owing to the vast expansion of the hospital building programme. Those appointed will be members of a team designing the engineering services for new hospitals, extensions, etc.; they will work under the general control of an experienced professional engineer, but they will themselves be responsible for the design and management of individual schemes. The work is complex in nature and extremely interesting and offers a challenge to the engineer who wants more than the usual run of job.

Applicants should be A.M.I.Mech.E., or A.M.I.E.E., or A.M.I.H.V.E., but Graduate Members of these Institutions will be accepted provided that in the case of the Institution of Heating and Ventilating Engineers they have passed Sections A and B of the Institution examination.

SALARIES will be within the range of £910/£1,600 plus £40-£50 London Weighting. The minimum point of entry for Corporate Members of the major Institutions is £1,160 plus £50 London Weighting. A bar exists at £1,400 plus £50 beyond which it is necessary to be A.M.I.Mech.E. or A.M.I.E.E., and Graduates do not proceed beyond £1,205 plus £50 until they have obtained Corporate Membership when continuance up the scale is automatic.

It is expected that these posts will be accepted by the professional institutions as leading to Corporate Membership provided other conditions have been fulfilled. A scheme for study leave is in process of inauguration.

APPLY, stating age, qualifications (with dates) and experience, with names of two referees, to the Secretary, North West Metropolitan Regional Hospital Board, 40 Eastbourne Ter, London W.2, quoting reference 823. Enquiries by telephone or visit by appointment to the Board's headquarters offices would be welcome. Tel. AMBassador 8011, Ext. 330. (R 25)

REPRESENTATIVES

Old established manufacturers of distribution equipment and accessories will be appointing Representatives for (a) London, (b) Southern Counties and (c) Midlands. Exceptional scope for successful candidates who will receive training. Age 25/30 and must be men with good education and personality. Fullest details in strict confidence to Box No. 7881, Electrical Times.

(R 84)

DRAUGHTSMAN required for Consulting Engineer's office, to assist in the design of lighting and power installations for all classes of buildings. Five-day week. Spring and summer holidays. Pension scheme and luncheon vouchers. Apply in writing, stating age, experience, present salary and salary required to: J. Roger Preston and Partners, 15 North Audley St, W.1. (R 89)

SUPERVISOR

Established Electrical Contractors in N.W. London require supervisor capable of estimating for and carrying through Contracts for industrial and public authority work. Contributory Pension Scheme.—Box No. 7871, Electrical Times. (R 28)

ELECTRICAL DESIGN ENGINEER required to work with minimum supervision on interesting power and lighting schemes for major building projects. H.N.C. level of ability required. Apply in writing giving full details of age, experience and salary required to: Norman and Dawbarn, Architects and Consulting Engineers, 7 Portland Pl, London W.1. (R 19)

ELECTRICAL CONTRACTORS require an estimator for industrial and commercial installations. Only fully experienced men who are conversant with all types (including FLP) need apply.—Please write stating experience qualifications and salary required to Box No. 7873 Electrical Times. (R 29)

ESTABLISHED Electrical Engineering concern engaged in manufacturing and repair of electric motors and transformers require QUALIFIED ELECTRICAL ENGINEERS for staff appointments in United Kingdom. Age limit 37. Good conditions. Applications stating training, qualifications, experience, present position, to Box No. 7885, Electrical Times. (R 86)

ELECTRICAL ENGINEER required for Consulting Engineer's office, to carry out the design of lighting and power installations for all classes of buildings. Five-day week. Spring and summer holidays. Pension scheme and luncheon vouchers. Apply in writing, stating age, experience, present salary and salary required to: J. Roger Preston and Partners, 15 North Audley St, W.1. (R 88)

ELECTRICAL ENGINEER

required by

BRITISH HYDROCARBON CHEMICALS LIMITED

at their Works at Grangemouth. Minimum qualifications: Higher National Certificate. The salary will be in accordance with age and experience, and there is a non-contributory Pension Scheme in operation. Replies, in writing, to be addressed to the Administrative Officer, British Hydrocarbon Chemicals Ltd., Bo'ness Rd, Grangemouth. (R 27)

British Railways (Southern Region) require an **ELECTRICAL ENGINEERING TECHNICAL ASSISTANT** in the MANCHESTER AREA for the inspection and testing of electric and diesel electric rolling stock and power supply equipment at Contractors' Works.

Applicants should have had a sound technical training and have reached a standard of not less than that of the Higher National Certificate in Electrical Engineering. Manufacturing experience essential.

Commencing salary, £990 per annum rising to £1,034 after two years.

Application forms may be obtained from the Chief Mechanical and Electrical Engineer, British Railways, Southern Region, 15 St. Thomas Street, London Bridge, S.E.1. (R 56)

ELECTRICAL ENGINEER required for Glasgow office staff, age 23-28. Applicants (H.N.C. minimum) should have had experience in the manufacture of electrical machines. Progressive salary with non-contributory pension. Applications stating age, nationality, qualifications and experience to British Engine Boiler and Electrical Insurance Co. Ltd., 98 West George St, Glasgow C.2. (R 79)

JOINTER (Extra High Tension) required. Present rate of pay 5s 1½d per hour. N.J.I.C. conditions. 42-hour 5-day week. Holiday, sick pay and optional superannuation schemes. Apply, by letter, within 14 days, stating age, experience and present position to District Manager, Midlands Electricity Board, Gaolgate, Stafford. (R 53)

TECHNICAL ASSISTANT (LIGHTING) required, capable of designing all classes of gas and electric lighting installations. Good technical groundwork in Illuminating Engineering and some experience in practical application. Technical qualifications an advantage. Commencing salary £875 rising to £948. Apply, giving details of experience, etc. (quoting reference "ET") to Chief Civil Engineer, British Railways, Southern Region, Waterloo Station, London S.E.1. (R. 55)

YOUNG MAN, aged about 25, of good education, with sound electrical training, required as technical representative for the sale of resistance alloys in the Midlands and South. Excellent prospects for the right man. Apply by letter to General Sales Director, Hall and Pickles Ltd., Port St, Manchester 1. (R 57)

THE HEPWORTH IRON COMPANY LIMITED

DEVELOPMENT ENGINEER

Minimum qualification H.N.C. in Electrical Engineering and preferably well experienced in distribution and orthodox cable jointing practices. The successful candidate will be based at Kingston upon Thames and will be given considerable scope and every opportunity to develop new techniques including the jointing of both paper and plastic insulated cables.

Applications will be treated in the strictest confidence and should be sent under confidential cover endorsed "Development Engineer" to the Sales Manager, The Hepworth Iron Company Ltd., 116 Canbury Park Road, Kingston upon Thames. (R 50)

LIGHTING ENGINEER/DRAUGHTSMAN required by leading lighting fittings manufacturer. Capable of preparing interior lighting designs, estimates, surveys, etc. Age 22/28. Salary depending on age and experience. Write Box No. 7883, Electrical Times. (R 85)

MAINTENANCE ELECTRICIAN with some contracting experience required. Basic wage £11 12s plus overtime. Pension Fund. Canteen facilities. State age when applying. — Gillman and Spencer Ltd., Rotherhithe, S.E.16. BER 2601. (R 49)

SPECIFICATION WRITER/ENGINEER. A vacancy exists with Sangamo Weston Ltd., at Enfield, for a young man having a light electrical engineering background and educated to H.N.C. (Electrical) standard. Work entails preparation of specifications of electrical measuring instruments to meet customers' requirements and liaison between development laboratories and contracts department.—Write giving full particulars of experience, etc., to the personnel Manager, Sangamo Weston Ltd, Cambridge Rd, Enfield, Middx. (R 24)

WANTED

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of second-hand machinery and plant for re-use.—W. and H. Cooper Ltd., 17 Brady St, Bethnal Green, E.1. (R 1)

9 AND 10 kVA ex W.D. ALTERNATORS wanted: B.T.H., G.E.C., 1,500 r.p.m.—Box No. 7889, Electrical Times. (R 95)

WORK WANTED

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service, fully guaranteed. Edgware 8566 (4 lines). — Service Electric Co. Ltd., Stanmore, Middx. (R 2)

METALWORK. All types of cabinets, chassis, racks, etc., to your own specification. — Philpotts Metalworks Ltd., Chapman St, Loughborough. (P 12)

NEWLY FORMED ELECTRICAL/ELECTRONIC FIRM have capacity available, for manufacturing in Electromechanical and Electronic fields.—Box No. 7851, Electrical Times. (R 16)

PUBLICITY PHOTOS guarantee the best in Technical and Industrial Photography. All subjects undertaken.—205a Upper Tooting Rd, S.W.17. Balham 9336. (R 17)

PATENTS

THE Proprietor of British Patent No. 705,965 for "IMPROVEMENTS IN MOVING COIL DIAPHRAGMS FOR ELECTRODYNAMIC SOUND TRANSMITTING AND RECEIVING DEVICES," desires to enter into negotiations with a firm or firms for the sale of the patent or for the grant of licences thereunder. Further particulars may be obtained from Marks and Clerk, 57 and 58 Lincoln's Inn Fields, London W.C.2. (R 90)

THE Proprietors of British Patents Nos. 748121 for "PRINTING TELEGRAPH APPARATUS," 748,139 for "KEYBOARD TRANSMITTER" and 748,140 for "SELECTOR MECHANISM FOR PRINTING TELEGRAPH APPARATUS," desire to enter into negotiations with a firm or firms for the sale of the patents or for the grant of licences thereunder. Further particulars may be obtained from Marks and Clerk, 57 and 58 Lincoln's Inn Fields, London W.C.2. (R 91)

THE Proprietor of British Patent No. 770,762 for "RADIO DIRECTION FINDER," desires to enter into negotiations with a firm or firms for the sale of the patent or for the grant of licences thereunder. Further particulars may be obtained from Marks and Clerk, 57 and 58 Lincoln's Inn Fields, London W.C.2. (R 92)

FOR SALE

A.C. and D.C. MOTORS, GENERATORS from stock.—Service Electric Co. Ltd., Honeypot La, Stanmore, Middx. Edgware 5566/9. (R 4)

A.A. ELECTRICAL CO. for A.C.-D.C. MOTORS, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—Chi 5105, 67 Rothschild Rd, W.4. (R 2)

A.C. and D.C. SLOTMETERS: Time Switches and Quarterly Meters. Single and polyphase, 2½—100 amps. Tested and guaranteed 2 years. Television and Billiards Meters. — Tradex Meter Co., Surbiton. Elmbridge 2234/5/6. (R 9)

ELECTRIC MOTORS, D.C. and A.C. Motor Generator Sets, Alternators and Dynamos, Diesel Sets, Circuit Breakers, Switchboards, reconditioned and guaranteed. Very large stocks held.—Britannia Manufacturing Co. Ltd., Britannia Walk, N.1. CLErkenwell 5512-3-4, Stores at Chobham, Surrey. (R 7)

FOR SALE—300 kW MERCURY ARC RECTIFIER. Input 6,600 volts, Output 500 volts, 600 amps, with tappings, by E.C.C. Equipment about four years old, practically unused. Price: £1,250, original cost £4,000.—Davidsons Engineers (M/CRO) Ltd., Irkdale St, Smedley Rd, Cheetham Hill, Manchester 8. Telephone No.: COLlyhurst 1610. (R 94)

HOUSE-SERVICE METERS, all types can be obtained by return from Selectrics, Dept. E.T., Meter Hse, Factory Row, Castle Circus, Torquay. Phone 7218. (R 8)

PURLEY CHOKES AND BALLASTS. Our 80-W tapped h.p.f. ballast with starter switchgear-holder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s 6d each subject. —F. W. Blanshard Ltd. (Dept. E.T.), Purley, Surrey. Uplands 4818/9. (R 6)

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HOUSE-SERVICE METERS, A.C. or D.C., quarterly or prepayment.—Universal Electrical, 221 City Rd, London, E.C.1. (R 5)

PETBOW GENERATOR as new, type 16KM/E, 20 kVA, 16 kW, 230/400 volts, 3-phase, 4-wire, 50 cycles supply, DIESEL engine, electric starting, cost £870 in 1956. Best offer secures, can be seen in Cannock, Staffs.—Harborow Electrical Co., 110 Walsall Rd, Cannock Staffs. 'Phone: Cannock 2014. (R 93)

SECOND-HAND Electrical Plant can be as good as new if you buy it from specialists. Write for our stock list. Dynamo and Motor Repairs Ltd., North End Rd, Wembley Pk, Middlesex. Telephone: Wembley 3121; Soho Rd, Handsworth, Birmingham. Telephone: Birmingham Northern 0898. (R 10)

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And

ALL Formed Wire Articles and Small Sheet Pressings

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PARKIN WIRE PRODUCTS LTD.

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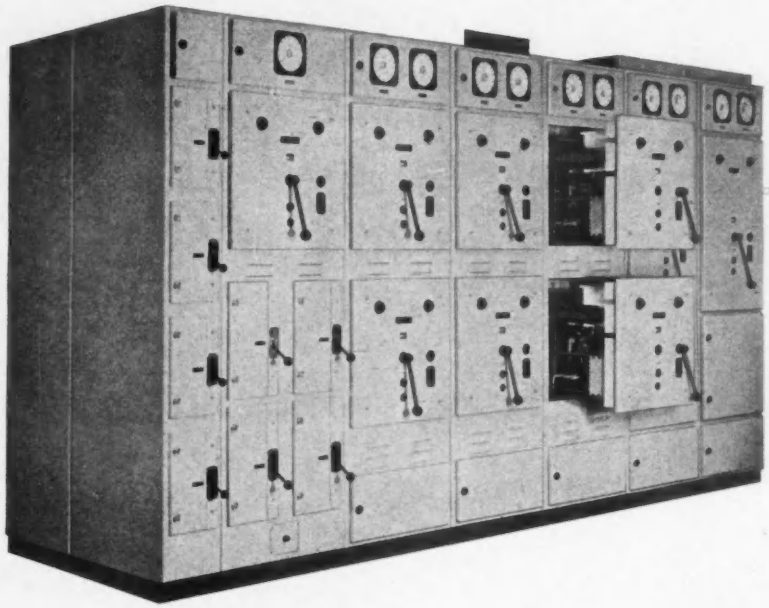
AIR BREAK SWITCHGEAR



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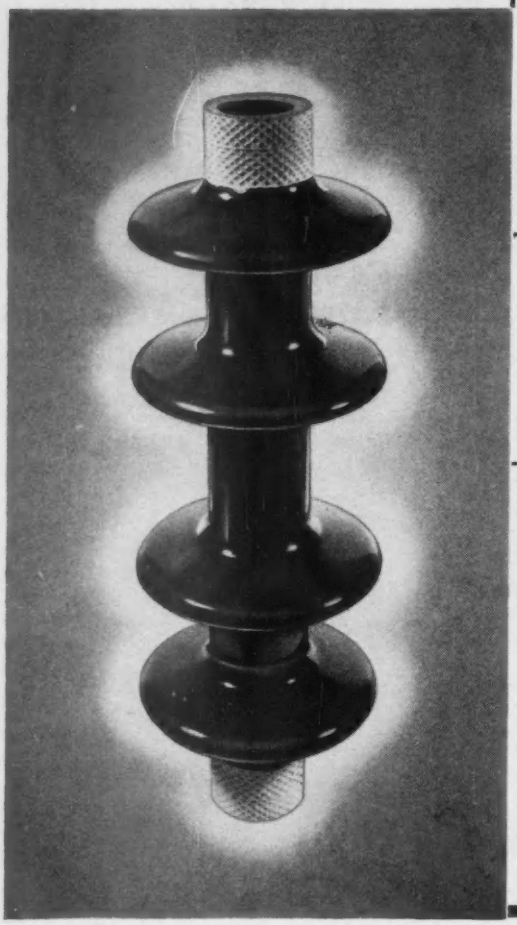

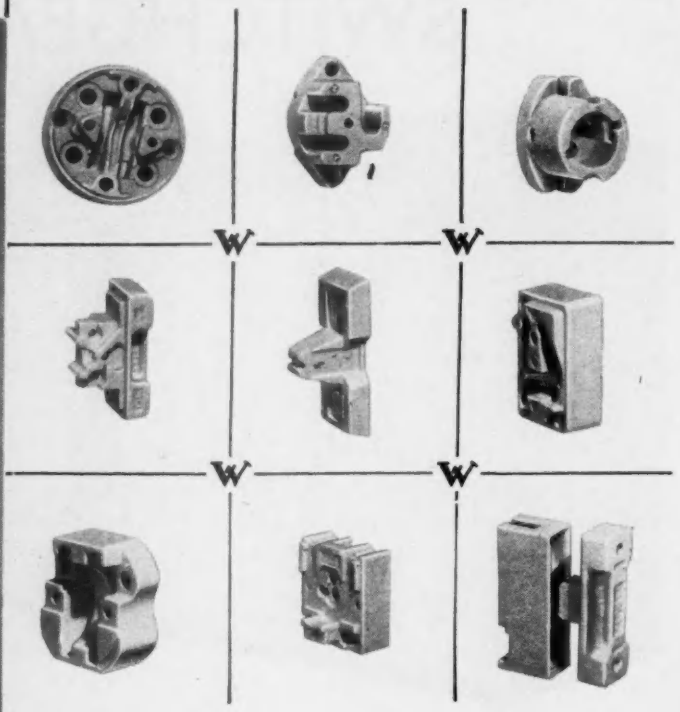

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It's Porcelain for Insulation ... It's Wade for Porcelain

Electrical Times, 2 June, 1960

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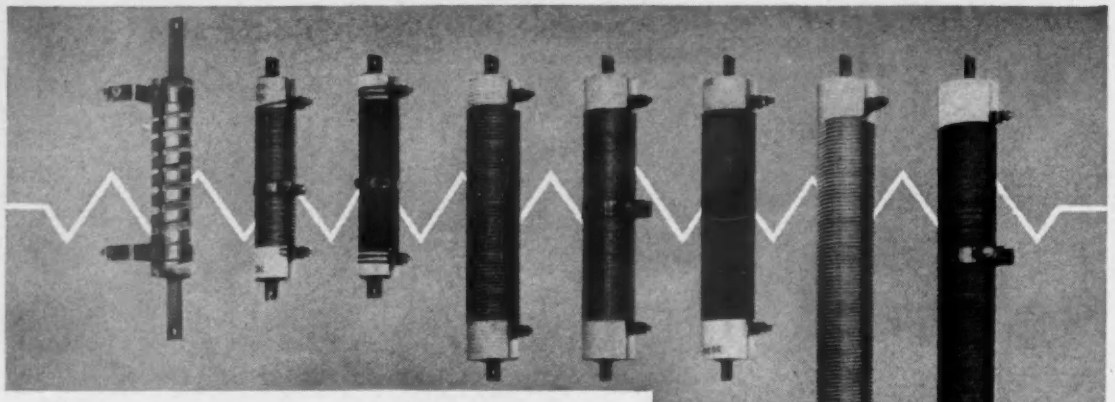
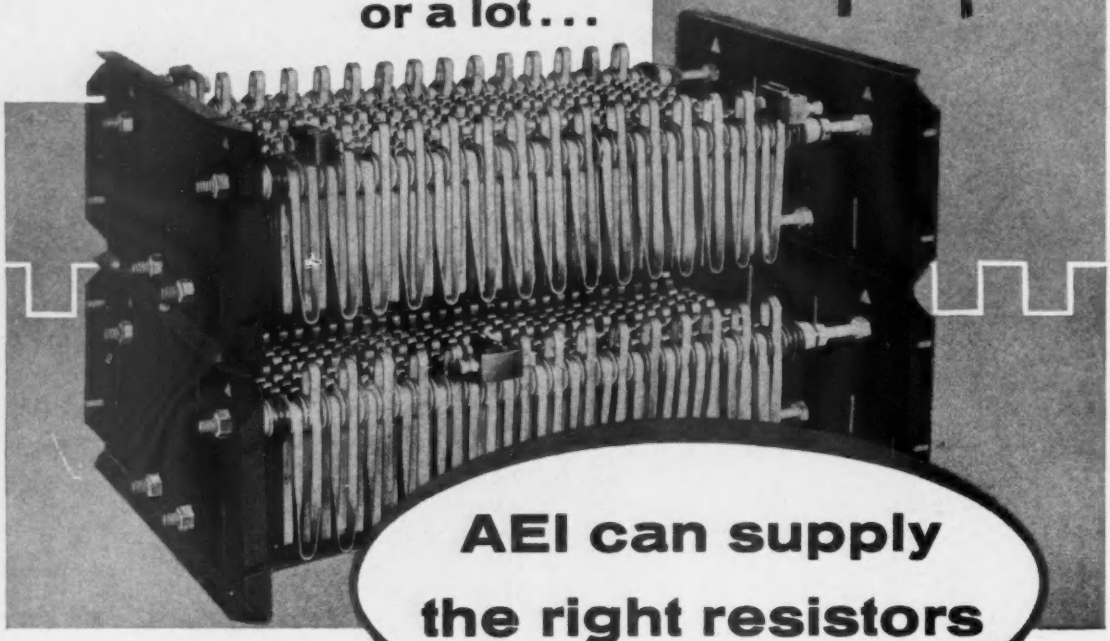


Whether you need a little

or a lot...



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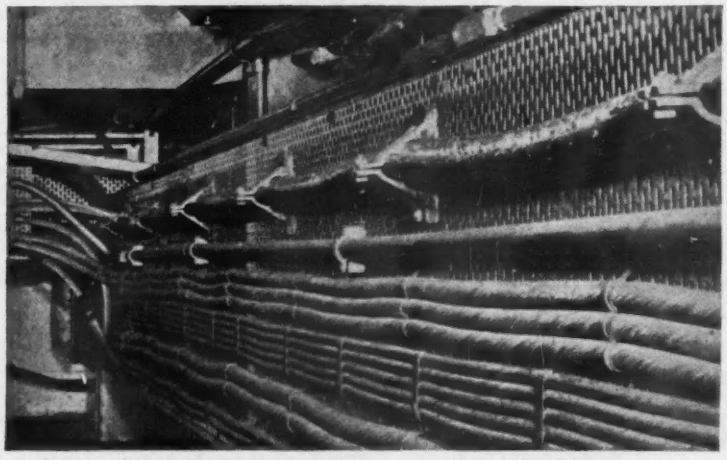

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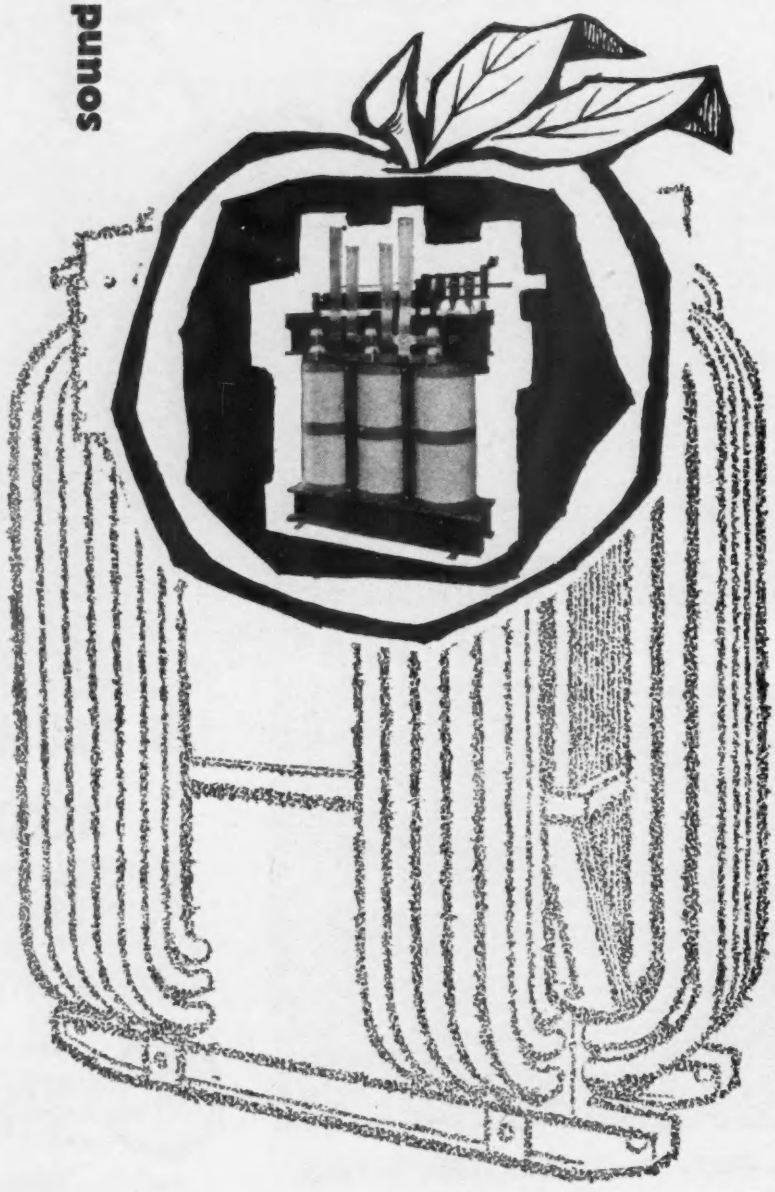

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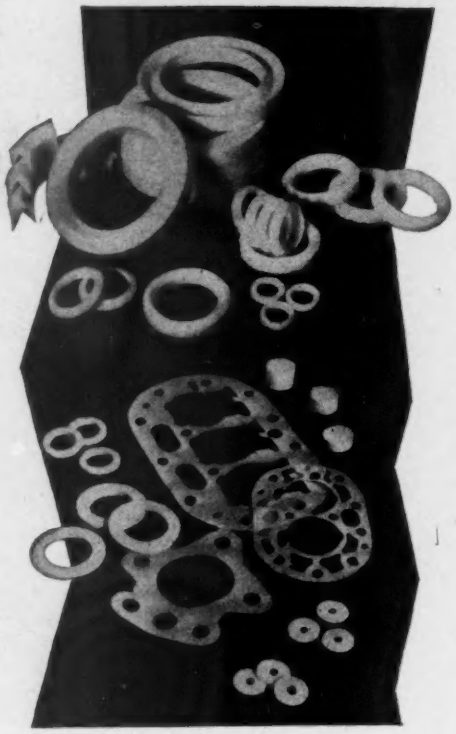

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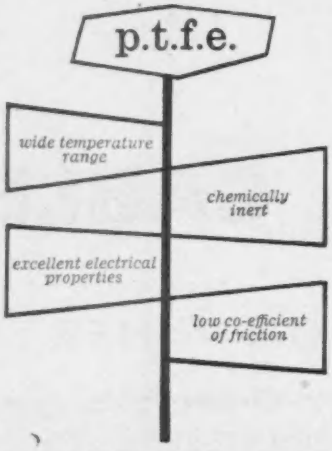

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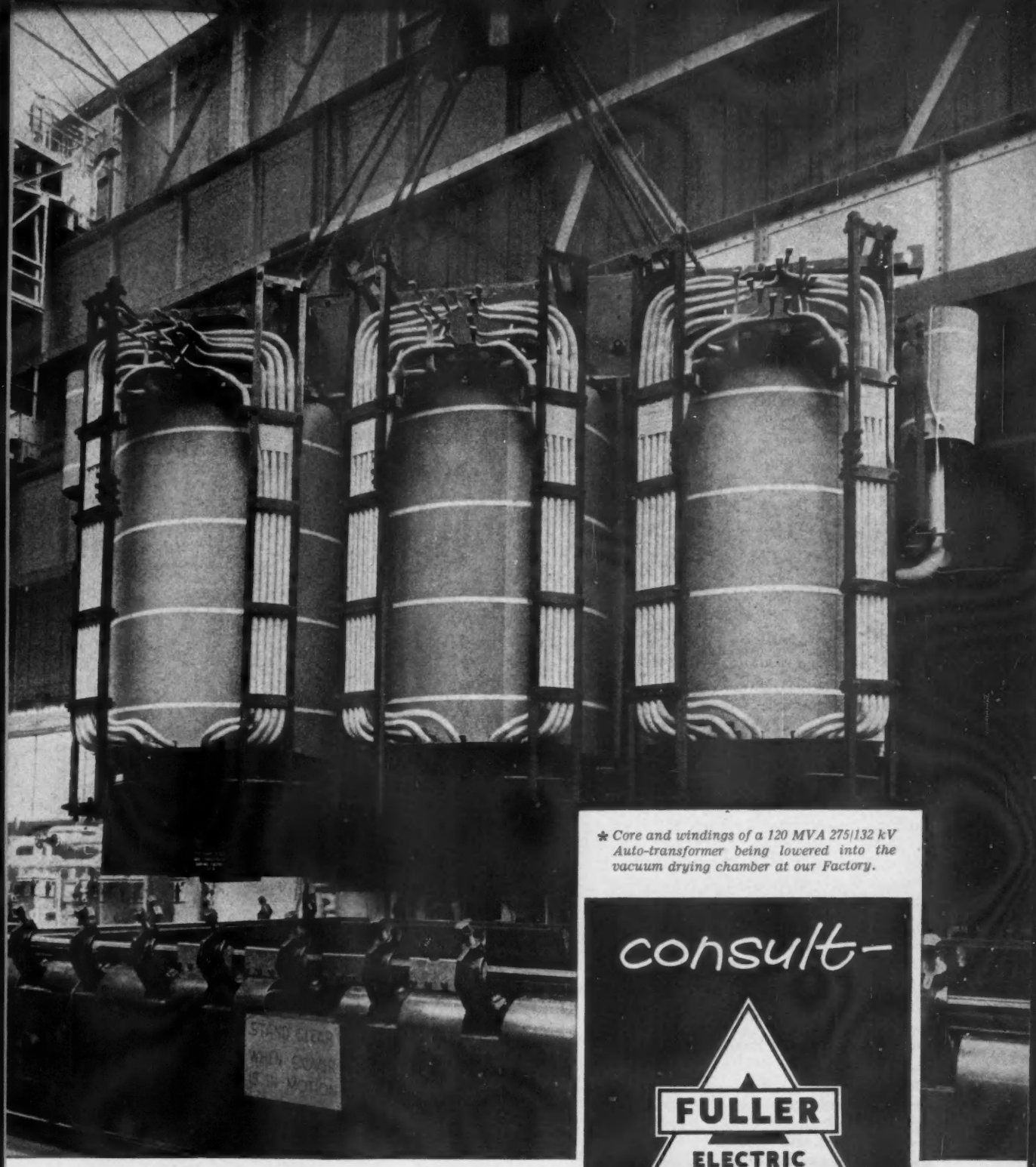

* *Core and windings of a 120 MVA 275/132 kV Auto-transformer being lowered into the vacuum drying chamber at our Factory.*

Modern plant and 40 years' experience ensure that we are particularly well-equipped to manufacture transformers up to the largest sizes and the highest voltages. Thanks to our long association with ASEA of Sweden, we have access to an unrivalled experience of 380 kV practice. Our up-to-date equipment includes a vacuum drying chamber with a capacity of 7,000 cubic feet suitable for the treatment of the largest units.

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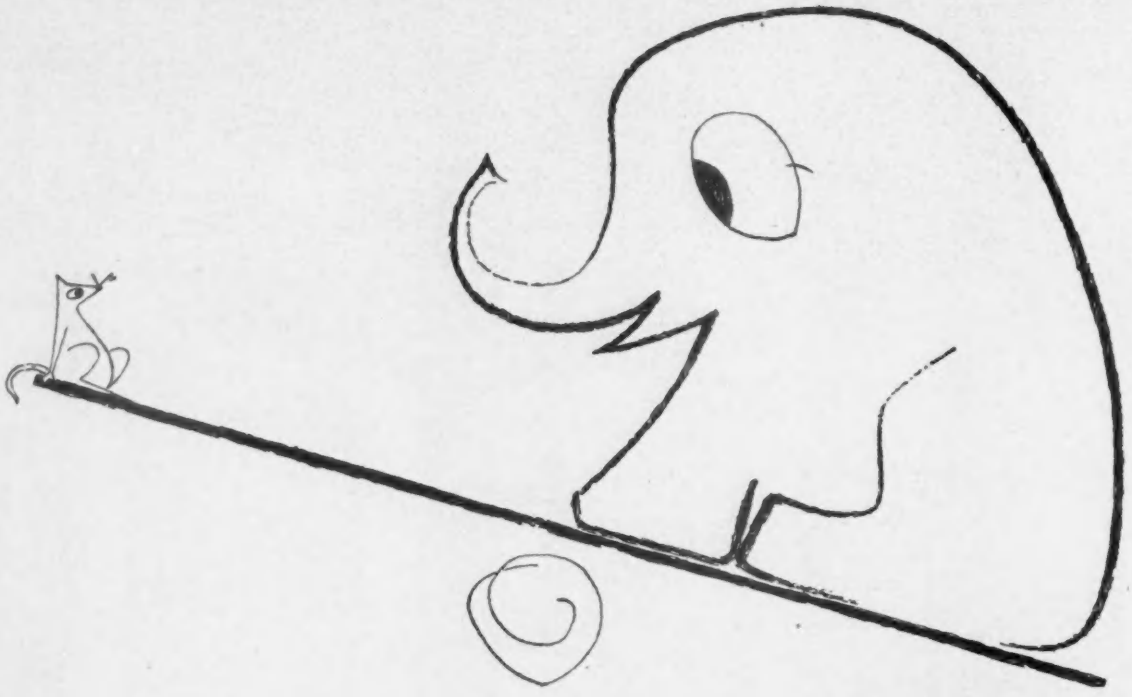

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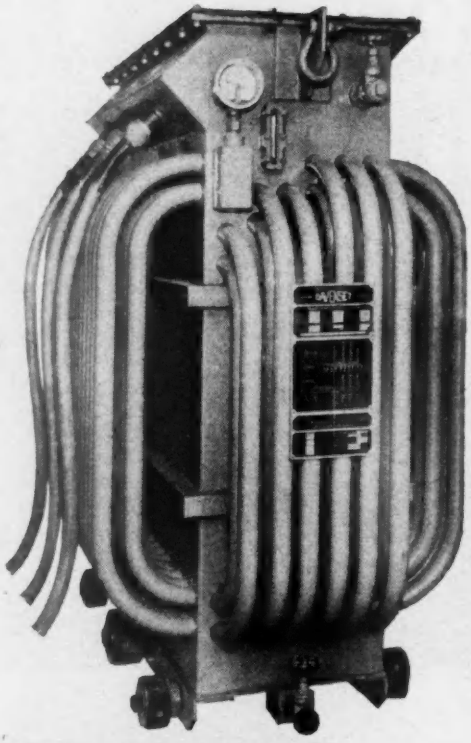

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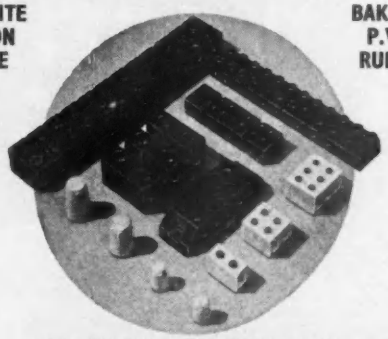

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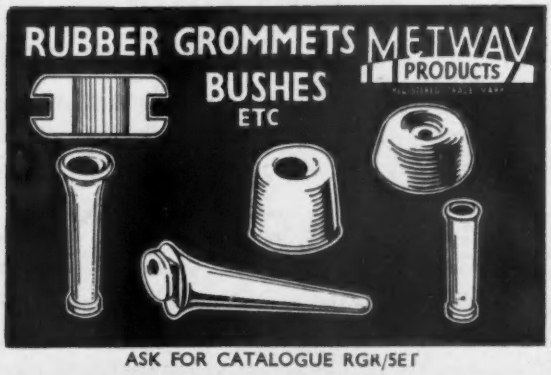

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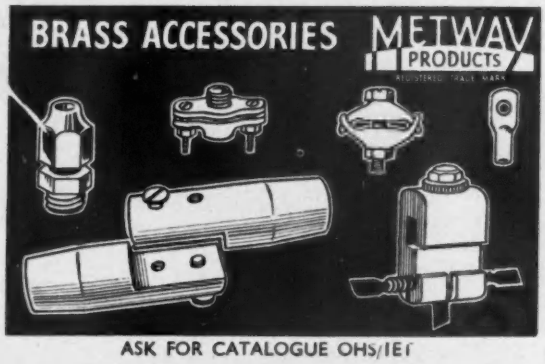

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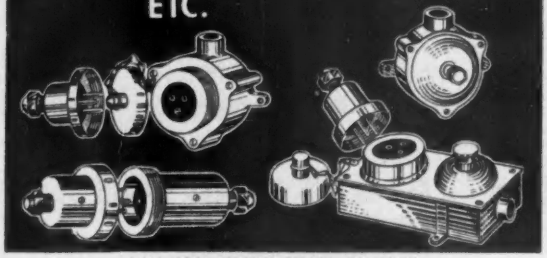

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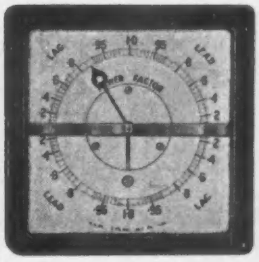

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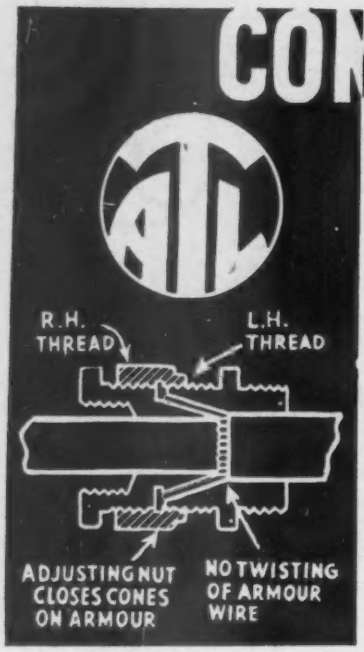

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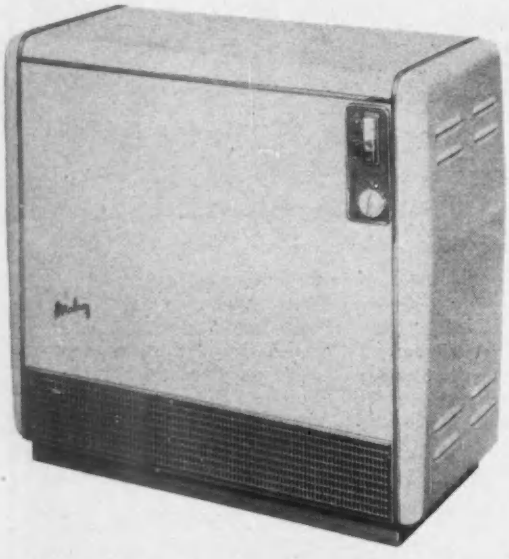

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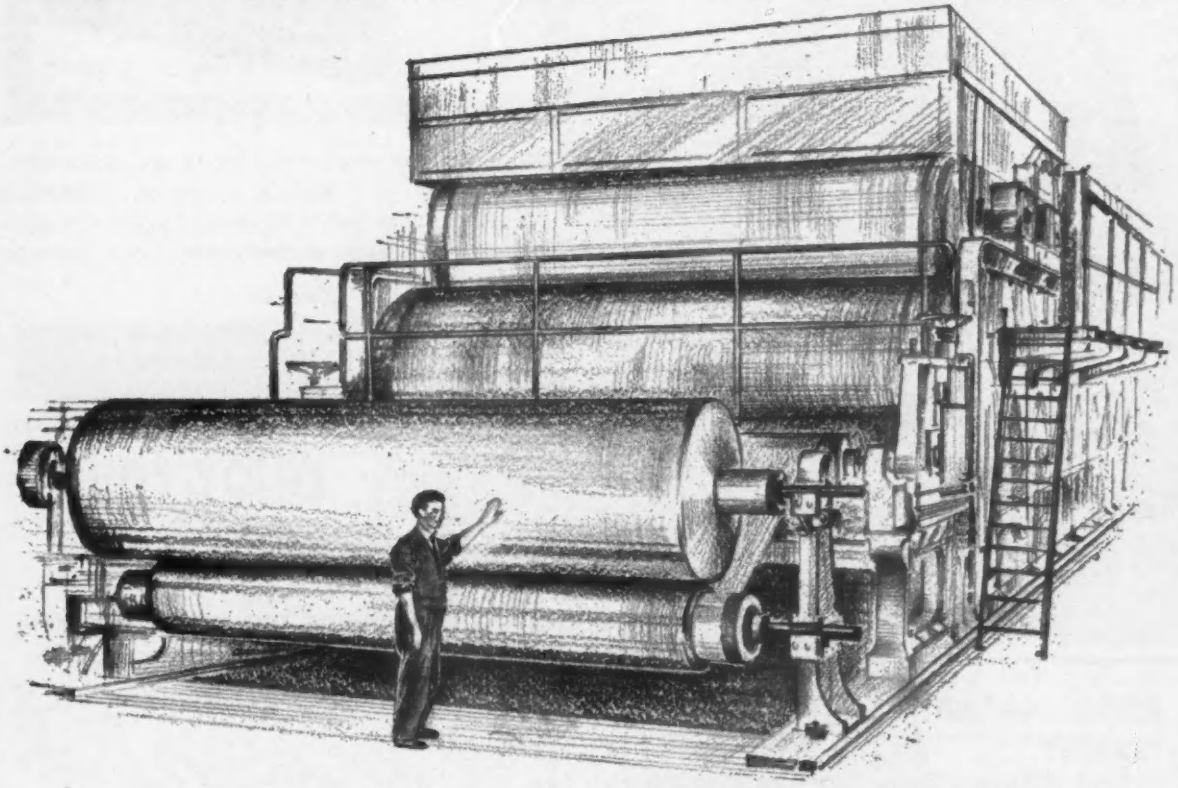

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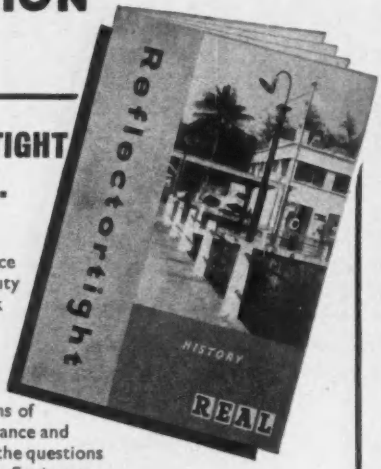

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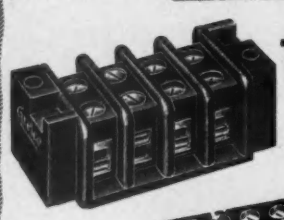

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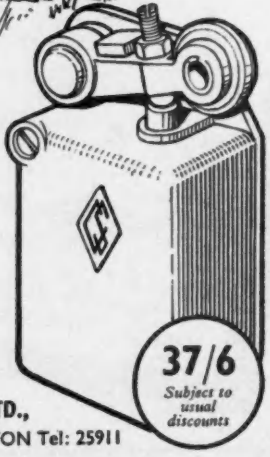

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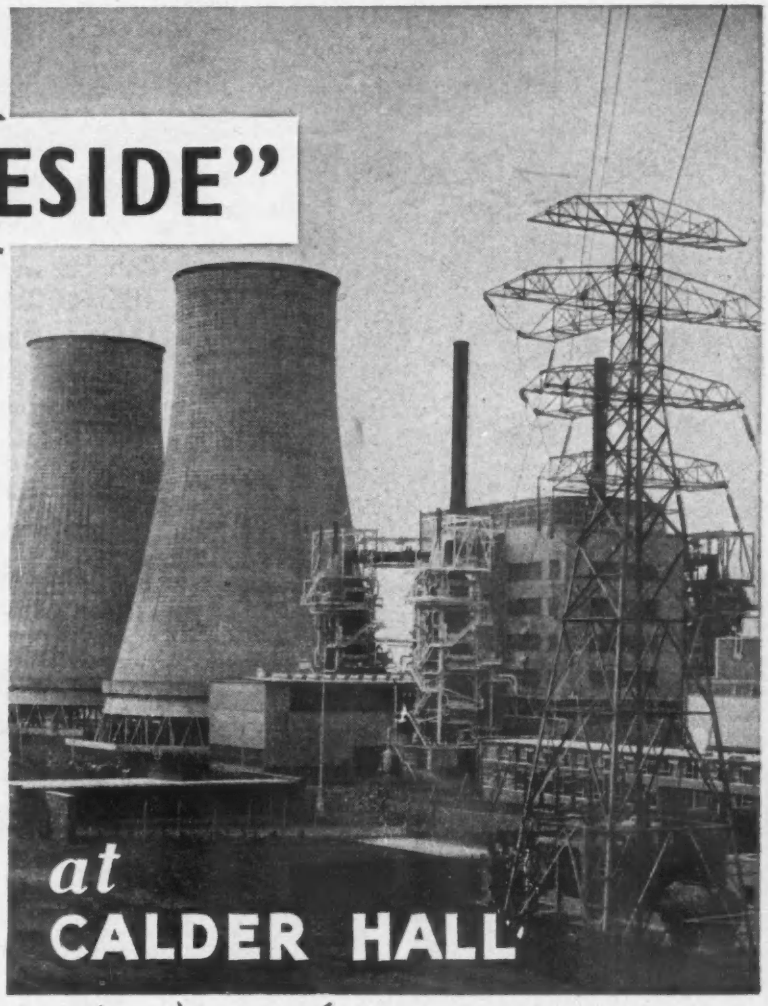

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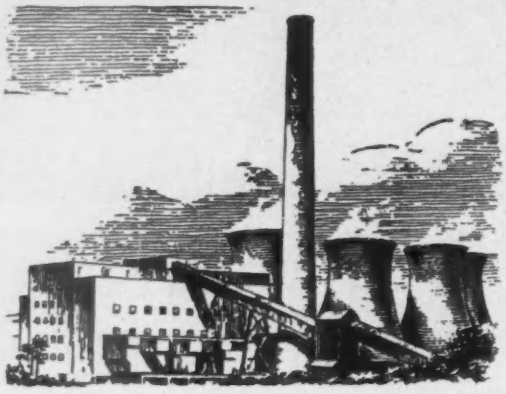

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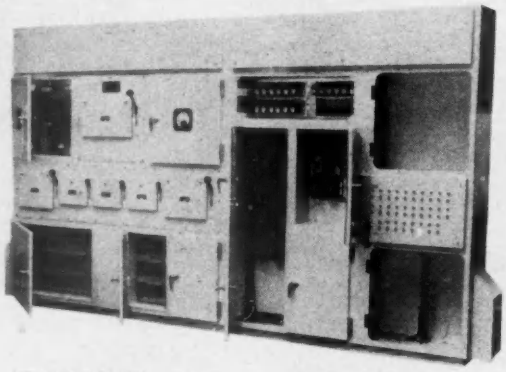

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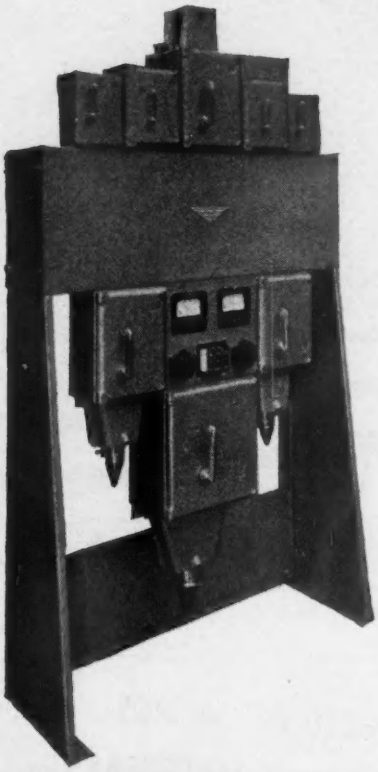

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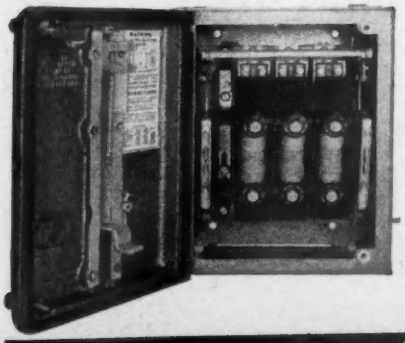

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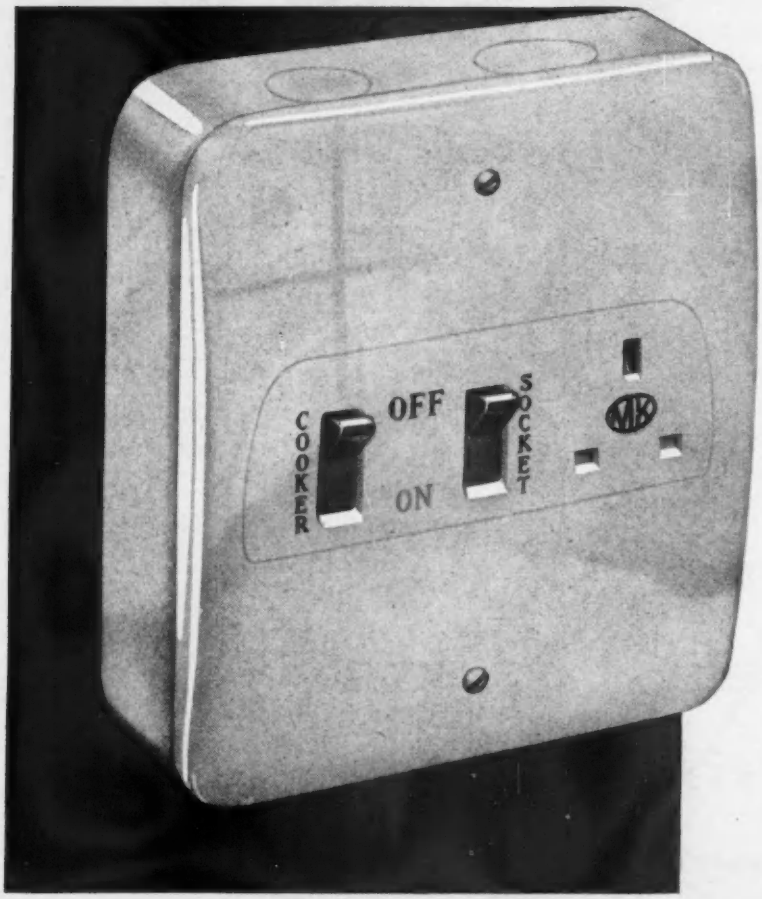

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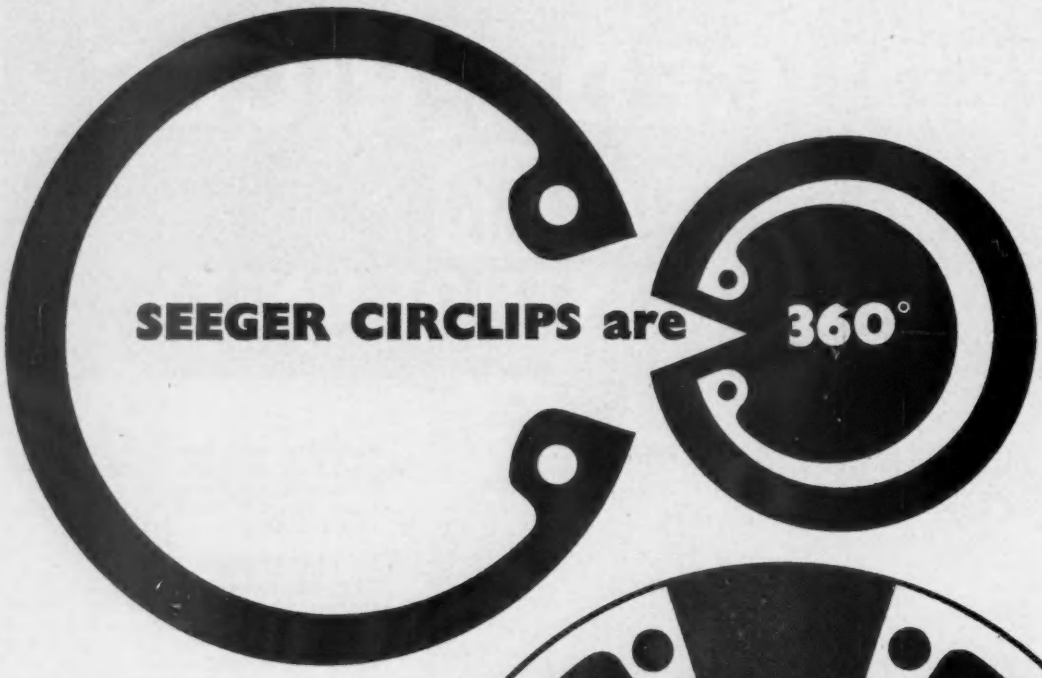

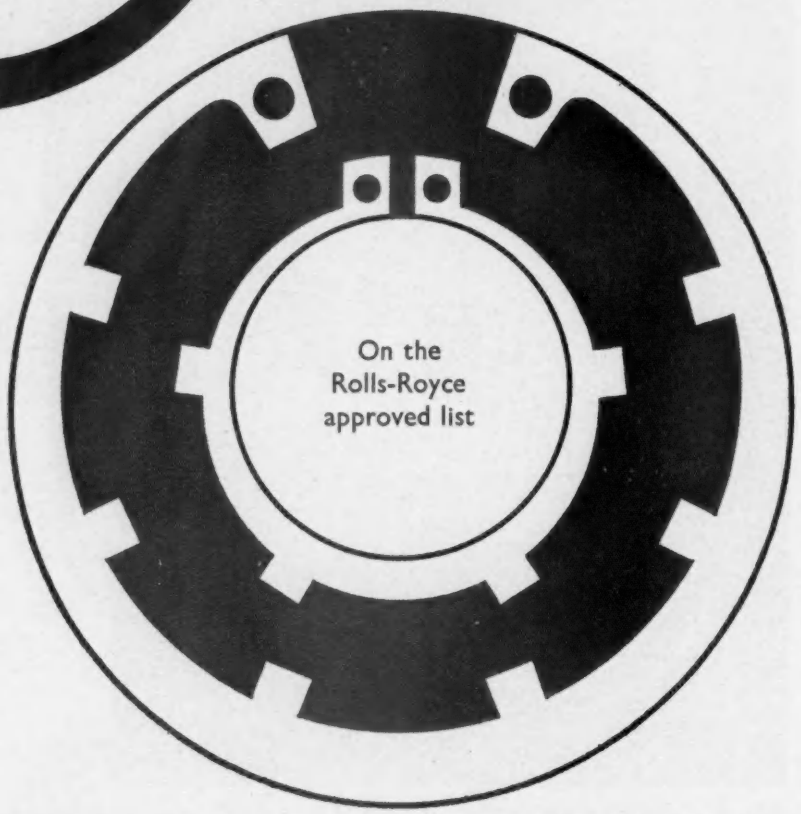

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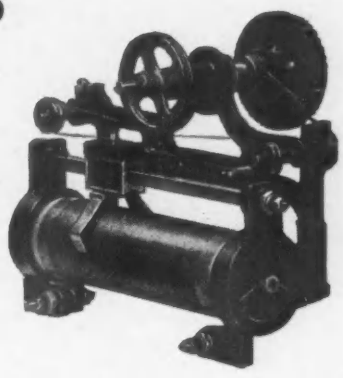

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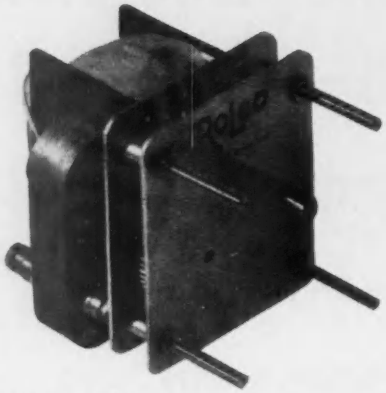

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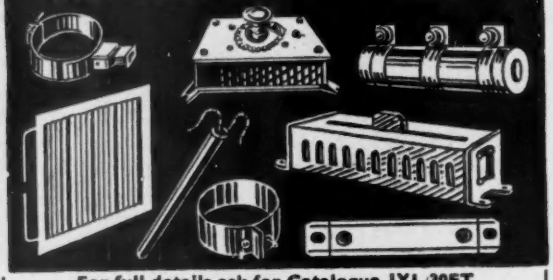

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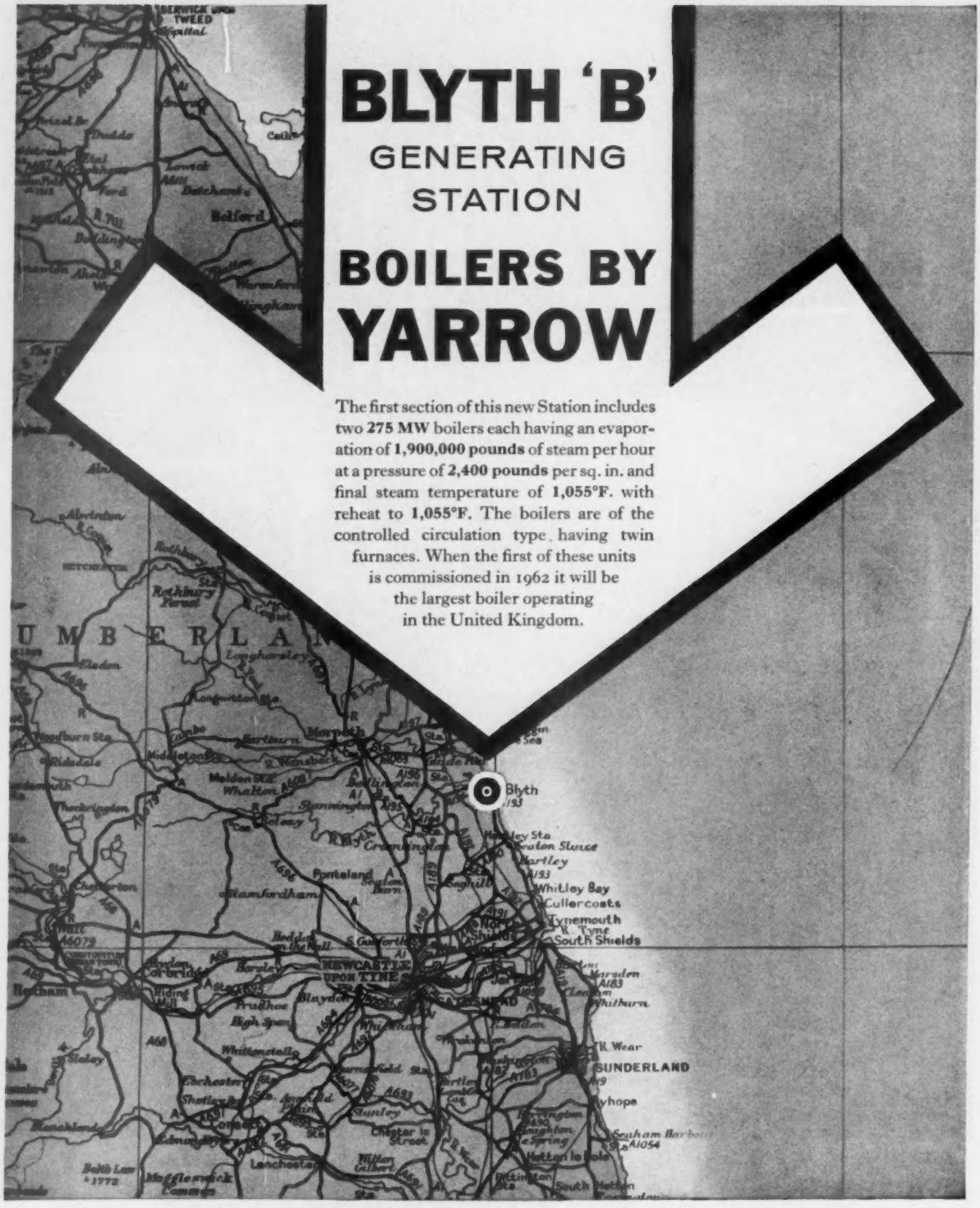

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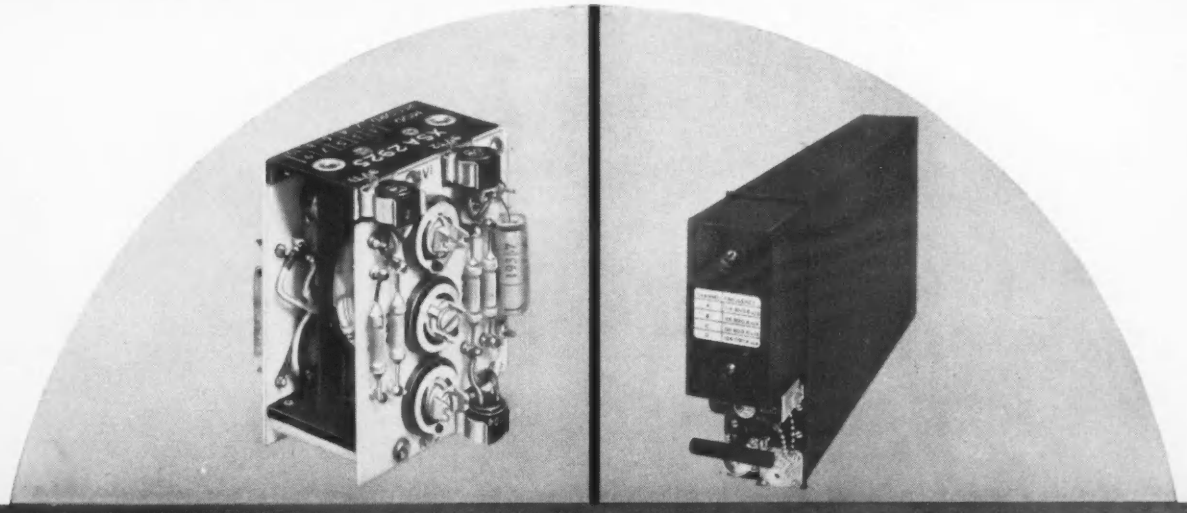

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